COWASEE Basin Focus Area

Conservation Plan

South Carolina Department of Natural Resources

February 2017

COWASEE Basin Focus Area

Conservation Plan

Prepared by

Bob Perry and Lorianne Riggin[1], and Dr. Scott Howard[2]

February 2017

Acknowledgements

The preparers thank the following South Carolina Department of Natural Resources staff for their special expertise and contributions toward the completion of this report: Heritage Trust database manager Julie Holling; GIS applications manager Tyler Brown for mapping and listing of protected properties; hydrologist Andy Wachob for information regarding water resources; fisheries biologists Kevin Kubach, Mark Scott, Hal Beard and Jim Bulak for information regarding aquatic resources; hydrologist Andy Wachob for information on hydrologic resources; and wildlife biologists Willie Simmons and Amy Tegeler for information regarding wildlife resources.

[1] South Carolina Department of Natural Resources, Office of Environmental Programs.

[2] South Carolina Department of Natural Resources, Geological Survey.

COWASEE Basin Focus Area Conservation Plan

The goal of this conservation plan is to provide science-based guidance for future decisions to protect natural resource, riparian corridors and traditional landscape uses such as fish and wildlife management, hunting, fishing, agriculture and forestry. Such planning is valuable in the context of protecting Waters of the United States in accordance with the Clean Water Act, particularly when the interests of economic development and protection of natural and cultural resources collide. Such planning is vital in the absence of specific watershed planning. As additional information is gathered by the focus area partners, and as further landscape-scale conservation goals are achieved, this plan will be updated accordingly.

This document is available at http:www.dnr.sc.gov/

COWASEE Basin Task Force Partners

Congaree Land Trust

Ducks Unlimited

Friends of Congaree Swamp

National Audobon Society

Natural Resources Conservation Service

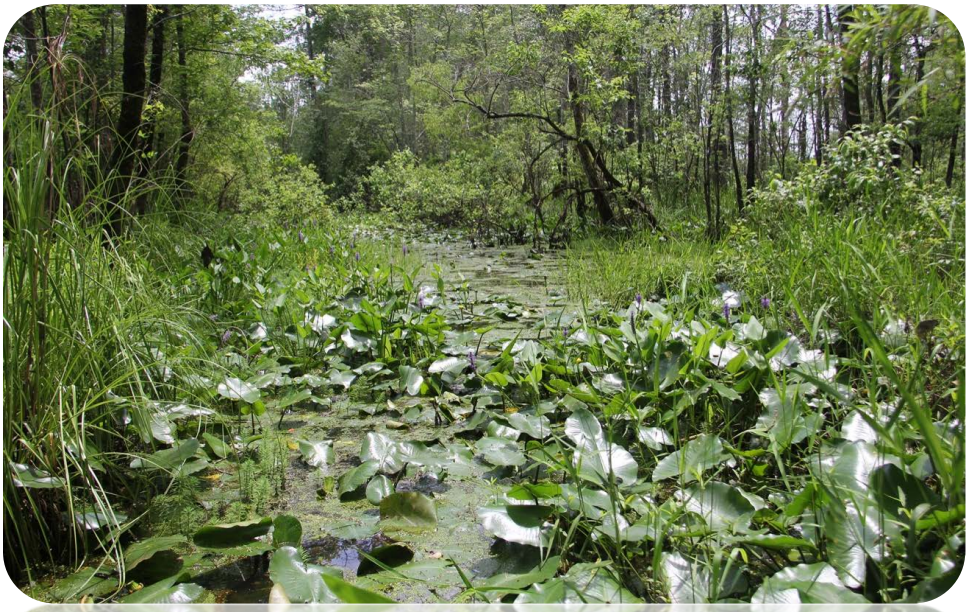
Private Landowners

Richland County Conservation Commission

South Carolina Department of Natural Resources

Sumter County Soil & Water Conservation District

United States Fish & Wildlife Service



This page intentionally left blank.

Table of Contents

1. Introduction

The Wateree River and Congaree River valleys and adjoining bluffs and high hills all merge in the heart of South Carolina to form the Santee River and headwaters of Lake Marion in the Santee-Southeastern Plains Ecobasin. This ecobasin contains all of 17 watersheds and portions of 30 others and covers 2,064 square miles. These three Palmetto State river valleys comprise the ecologically important COWASEE Basin, a significant corridor of rural, undeveloped green space southeast of Columbia and southwest of Sumter. COWASEE, short for the Congaree-Wateree-Upper Santee River system, is an area covering over 315,000 acres in the midlands of South Carolina including portions of Richland, Sumter, Clarendon, Calhoun, Kershaw and Lexington counties. Containing some of the most significant natural, historical and cultural resources in South Carolina, the COWASEE contributes to the quality of life of central South Carolina through abundant natural, cultural and scenic resources, diverse landscapes and public recreational opportunities. Recognizing its importance, conservationists, led by private landowners, non-government organizations, the United States Department of Agriculture and the South Carolina Department of Natural Resources (SCDNR) defined the COWASEE Basin Focus Area in 2005, naming it as one of the State's premiere landscape ecosystems and an area worthy and in need of conservation.

The COWASEE Basin Focus Area is defined to include its Congaree River Basin component bounded by Interstate-77 (I-77) between Interstate-26 (I-26) and S-40-48 (Bluff Road), thence southeast to US Highway 601, thence north to form the Wateree Basin component to Interestate-20, thence to US Highway 521, thence south following to SC Highway 261, thence southwest along the Seaboard Coast Line Railroad towards Rimini and across the upper end of Lake Marion to Lone Star, thence northwest along SC Highway 267 (McCords Ferry Road) merging into SC Highway 419, S-9-25 (Fort Motte Road), S-9-25 (Purple Martin Drive), and S-9-24 (Old Belleville Road) to US Highway 176, thence northwest to I-26 and thence to I-77 to complete the boundary (Appendix 1).

Included in the COWASEE Basin is the federally titled 26,546-acre Congaree National Park (U.S. Park Service) and state properties to include Wateree River Correctional Institute (S.C. Department of Corrections), Manchester State Forest (S.C. Forestry Commission), Poinsett State Park (S.C. Department of Parks, Recreation and Tourism), Congaree Bluffs Heritage Preserve (SCDNR), and Wateree River Heritage Preserve (SCDNR) and Upper Lake Marion also known as the Santee Swamp (S.C. Public Service

Authority). Additionally, the COWASEE Basin contains numerous private properties protected under conservation easements.

2. Recognized Conservation Plans

The COWASEE Basin is provides important migrating, wintering and breeding waterfowl habitat, shore and wading bird habitat, as well as habitat critical to neotropical migrant songbirds and a diverse group of bottomland forest bird species. Because of its importance to a broad group of bird species, the COWASEE Basin Conservation Project is conducted under the umbrella of a number of national and regional conservation initiatives to include the North American Waterfowl Management Plan (NAWMP) and its Atlantic Coast Joint Venture (ACJV), the North American Bird Conservation Initiative, Partners in Flight (PIF), the United States Shorebird Conservation Plan (USSCP) and the National Bobwhite Conservation Initiative (NBCI).

The NAWMP was initiated in 1985 in response to plummeting numbers of migratory waterfowl across the continent. The central premise of the NAWMP is protection and enhancement of existing nesting, migrating and wintering waterfowl habitat. The ACJV is the implementation program of NAWMP in the Atlantic states. The COWASEE Basin Focus Area is the implementation component of the NAWMP and ACJV. Thus, the actual habitat conservation efforts of the NAWMP occur at this level as through the local efforts of this project.

PIF was launched in 1990 in response to growing concerns about declines in the populations of many land bird species that were not covered under other conservation initiatives, particularly neotropical migrant species. The focus of PIF is to combine, coordinate and increase resources in order to achieve the highest order of success in bird and habitat conservation in the Northern Hemisphere. The USSCP was originated in the mid-1990s and its goals were formalized in 2000 in order to provide a scientific framework to determine species, sites and habitats that most urgently need conservation action. The NBCI is the unified strategic effort of 25 state fish and wildlife agencies and various conservation organizations to restore wild populations of bobwhite quail in this country to levels comparable to 1980 through restoration and maintenance of native grassland habitats to the benefit of a diverse assemblage of grassland dependent species.

3. Threats

The abundant, unique and diverse resources of the COWASEE Basin are under threat from a variety of contemporary land use practices and changes including encroaching development and urbanization, habitat loss and degradation, conversion of land to non-traditional uses and poor land use practices. Continued development and sprawl along the US Highway 378 corridor between the cities of Columbia and Sumter typifies the types of land use changes that threaten fish and wildlife populations and water quality within the COWASEE Basin. These land use changes and practices impact aquatic habitats by increasing silt and sediment loads, introducing excessive nutrients and chemical contaminants, altering water availability. The Santee-Southeastern Plains Ecobasin that encompasses the COWASEE Focus Area has the second highest density of active discharges permitted by the South Carolina Department of Health and Environmental Control (SCDHEC) with more than six discharges per 100 square miles.

A notable threat to the COWASEE is the Pinewood Site, a commercial hazardous waste landfill located on S-43-51 (Camp MacBoykin Road) between the town of Summerton and Pinewood that was in operation from 1980 until 2000 when the site's last owner, Safety-Kleen Inc., declared bankruptcy, closing the site to further waste. Now the Pinewood Site is in post-closure care, needing maintenance and monitoring in perpetuity as the site is one of the most contaminated sites in the Nation. Funds were set up to ensure post care of the site; however, SCDHEC deemed these funds to be insufficient for the long-term. As of 2016, the site is controlled with extensive monitoring under an appointed trustee following the bankruptcy settlement with management under SCDHEC oversight. Problems arose in June 2011, when DuPont, who was receiving, treating and disposing of the leachate, notified SCDHEC that they would no longer treat Pinewood's leachate after March 2012, or any other commercial waste. It was determined that the best option to treat the leachate was to use onsite treatment with evaporation and solids being disposed offsite in Texas. Effective October 31, 2014, Kestrel Horizons resigned as Trustee of the Pinewood Site and therefore, SCDHEC is now in the process of soliciting a vendor to provide the services needed to maintain and monitor the site. Due to the funding shortfall, the type of waste stored and the need for continued maintenance to process leachate from the landfill, any lack of post-closure care for this site could cause a series of contaminant issues in the immediate vicinity at Lake Marion and as far downstream as Charleston, threatening the water supply for over one million citizens.

Another threat to natural resources occurs when required habitats are not only altered, but fragmented. Habitat fragmentation negatively impacts wildlife population viability by reducing the amount or quality

of available habitat, removing native vegetation and increasing opportunities for invasive species to become established. Fragmentation occurs in aquatic habitats when barriers such as dams are erected in channels, or when culverts are improperly sized or situated making it impossible to traverse for migrating fish and other aquatic life. Fragmented habitats may not be large enough nor adequately connected to support species that need more territory in which to reproduce, rear young, forage for food resources and store healthy body reserves. The loss and fragmentation of habitat make it difficult for migratory species to find places to rest and feed along their migration routes. Small and disjoint patches of habitat support more tenuous populations of wildlife increasing their vulnerabilities to disease and predation. Habitat fragmentation along with urbanization also renders it difficult to continue traditional habitat management efforts. Along with reducing habitat fragmentation, the importance of maintaining riparian corridors and wetland buffers for aquatic organisms and herpetofauna also is critical. Improperly maintained riparian corridors and wetland buffers can degrade aquatic communities and decrease diversity with an increase in sedimentation and contaminated runoff from nearby urban areas. Efforts clearly are needed in the COWASEE Basin to support and maintain large, well-connected corridors of specialized habitat needs for threatened and endangered species and those that are rare in nature or species of conservation concern.

The management of whole ecosystems represents an ideal in conservation that is often impractical or difficult to achieve. However, the COWASEE Basin Focus Area presents a unique opportunity to protect, restore and enhance habitats at a landscape-scale. The COWASEE Basin contains the nation's largest remaining stand of old-growth bottomland hardwood forest in the southeast, in addition to other publicly owned resources such as Congaree Bluffs Heritage Preserve, Wateree River Heritage Preserve and the Manchester State Forest. Roughly 68% of the land within the Basin is privately owned. The focus area concept encourages conservation of private land through voluntary conservation easements. The addition of privately owned conservation areas, particularly those adjacent to or in close proximity to larger or ecologically sensitive

areas, acts to protect and enhance the existing outstanding natural, cultural and recreational resources of the COWASEE Basin.

4. Objectives

In 2005 a partnership of private landowners, conservation organizations, land trusts and government agencies came together to partner on the COWASEE Basin Focus Area, an initiative to maintain and enhance conservation and natural resources of the area (Appendix 1). Since large public ownership within the COWASEE Basin is achievable typically only through scarce agency funding and governmental appropriations, the partnership primarily works with willing private landowners to promote stewardship using a variety of tools ranging from technical and financial assistance to conservation easements. The key for this initiative is to encourage the continuation of private ownership while ensuring

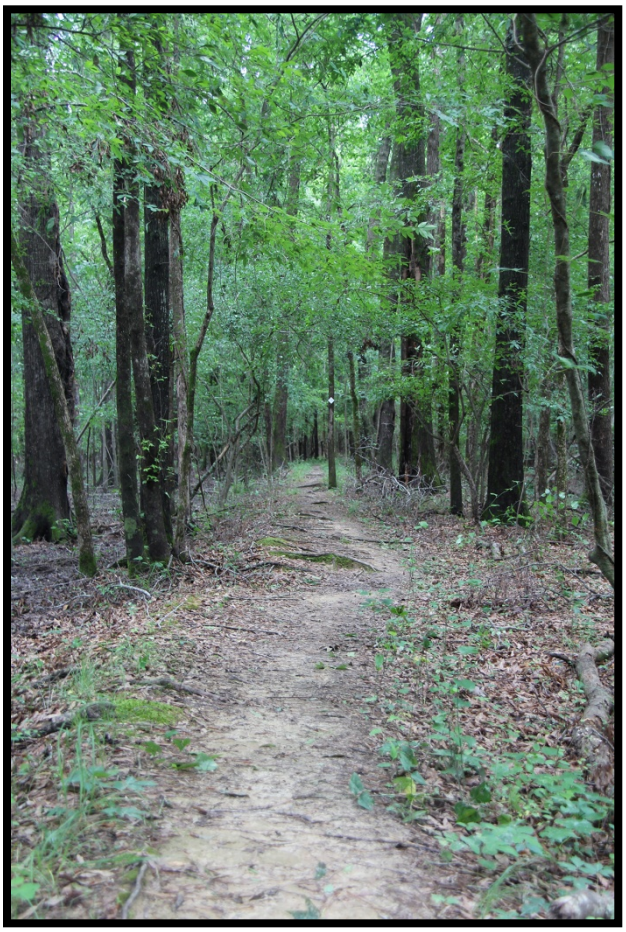
Table 1. Protected Lands in the COWASEE Basin Focus Area.*

Federal		**Property Manager**
Congaree National Park	26,546	U.S. Park Service
State		**Property Manager**
Congaree Bluffs Heritage Preserve	201	S.C. Department of Natural Resources
Manchester State Forest	21,500	S.C. Forestry Commission
Poinsett State Park	1,000	S.C. Department of Parks, Recreation & Tourism
Santee Swamp	16,000	S.C. Public Service Authority
Wateree Correctional Institute	7,000	S.C. Department of Corrections
Wateree Heritage Preserve	4,432	S.C. Department of Natural Resources
County		**Property Manager**
Mill Creek Mitigation Bank	1,789	Richland County Conservation Commission
Private Easements		**Property Manager**
Congaree Land Trust	16,875	
Congaree Land Trust /Midlands Area Joint Installation Consortium	3,004	
Ducks Unlimited	4,846	
North American Land Trust	2,865	
U.S. Natural Resources Conservation Service	13,050	
Total Protected Lands in Acres	**119,108**	
**November 2015 GIS data*		

long-term protection and enhancement of resource stewardship. As of 2016, there are more than 119,000 acres of protected property in the COWASEE Basin to include more than 40,000 acres of private land conservation (Table 1).

The overarching objectives of the COWASEE Basin Focus Area Project are to protect and enhance important lands, waters, rare and sensitive habitats, cultural sites and diverse natural resources of the midlands while maintaining in perpetuity, for the benefit of Palmetto State citizens, the long-honored traditional uses of hunting, fishing, forest management and agriculture.

5. Natural Resources



The heart of the COWASEE Basin consists of the life-giving waters of the Congaree, Wateree and Upper Santee rivers which nourish their fertile floodplains. These great rivers drain an immense watershed of 13,000-square miles that stretches far into western North Carolina. Approximately 32% of the COWASEE Basin consists of state and federal lands including South Carolina's only national park, the Congaree National Park, as well as such significant state lands as Sparkleberry Swamp, Congaree Bluffs Heritage Preserve, Wateree River Heritage Preserve, Poinsett State Park and Manchester State Forest.

Most of the COWASEE Basin Focus Area consists of the bottomland hardwood forests of the Congaree, Wateree and Upper Santee rivers, but it also includes bordering river bluffs, high hills and uplands. Hardwood and hardwood-pine communities dominate the floodplains of the small streams, bluffs and their associated flooded flats. Fire is infrequent, due to the sheltered locations of these communities on bluffs or their isolation in the floodplain. American beech (*Fagus grandifolia*) inhabits the river bluffs (particularly on the Northern-facing slope) and slopes of drains and creeks, whereas the upland flats within the floodplains have American beech in combination with southern magnolia (*Magnolia grandiflora*) as the characteristic species of this habitat type. These habitats intergraded with the blackwater stream forest and river bottoms create some of the most extensive and biologically diverse floodplain forests in the Southeast. The Congaree, Wateree and Upper Santee rivers are bounded by classic blackwater river floodplain forest with canopies of bald cypress (*Taxodium distichum)*, swamp tupelo (*Nyssa biflora*) and red maple (*Acer*

rubrum). Other species commonly associated include tulip poplar (*Liriodendron tulipfera*), sweet gum (*Liquidambar styraciflua)*, pond pine (*Pinus serotina)*, loblolly pine (*P. taeda)* and laurel oak (*Quercus laurifolia)*. Floodplain forests are seasonally inundated by the river and represent the most deeply flooded of all Southeastern United States forest types. The shrub layer in areas subjected to frequent flooding is open, whereas areas with infrequent flooding may be fairly dense with pocosin-like shrub thickets or under suitable fire conditions, pure stands of Atlantic white cedar (*Chamaecyperus thyoides*).

Barred owl

Bottomland hardwood forests are usually associated with the broad floodplains of major rivers like the Congaree, Wateree and Upper Santee. This ecotype is dominated by a well-developed canopy of sweetgum (*Liquidambar styraciflua*), loblolly pine, water oak (*Q. nigra*), willow oak (*Q. phellos*), laurel oak, cherrybark oak (*Q. pagoda*) and American holly (*Ilex opaca*). At lower elevations, the river bottomland hardwood forests transform from an oak-dominated woodland to one with bald cypress, water tupelo (*N. aquatica*), swamp gum (*N. biflora*), Carolina ash (*Fraxinus caroliniana*), water elm (*Planera aquatica*) and red maple. These habitat types in combination provide some of the most productive wildlife habitats in North America. The high hills and bluffs, some of which exceed 350 feet above sea level, support vegetation more typical of the Upper Piedmont and Blue Ridge such as sourwood (*Oxydendrom arboreum*), mountain laurel (*Kalmia latifolia*), white ash (*F. Americana*), American beech, white oak (*Q. alba*) and shortleaf pine (*P. echinata*). Hillside seeps draining water through high hills and river bluffs support indigenous and unique floristic communities.

Isolated wetlands within the COWASEE Basin are also important habitats for a variety of species. Not only do they serve as potential water sources for wildlife, but they also provide a critical habitat component for a number of reptile and amphibian species, such as the tiger salamander (*Ambystoma tigrinim*) and upland chorus frog (*Pseudacris feriarum*). Some of the most imperiled herpetological species rely on isolated ephemeral wetlands for breeding, timing their reproduction to coincide with the filling of the ponds that provide fish-free environments for tadpoles and larvae to mature. Amphibians, an important component to overall biodiversity, serve as indicator species for water quality due to their reliance on water for portions of their life cycle. Healthy and diverse populations of amphibians are indicative of high quality habitat, both terrestrial and aquatic. Isolated wetlands, especially those that are ephemeral or

seasonally wet, are often overlooked as an integral landscape feature worthy of protection. Often overlooked, these areas are essential to maintain amphibian biodiversity and ecosystem function.

When exploring the splendor of these blackwater river systems, visitors may encounter river otter (*Lontra canadensis*); beaver (*Castor canadensis*); American alligator (*Alligator mississippiensis*); black swamp snake (*Seminatrix pygaea*); banded (*Nerodia fasciata*), brown (*N. taxispilota*) and red-bellied (*N. erythrogaster*) water snakes; Florida (*Pseudemys floridana*) and river (*P. concinna*) cooters; wood duck (*Aix sponsa*); raccoon (*Procyon lotor*); gray fox (*Urocyon littoralis*) and the elusive bobcat (*Lynx rufus*).

Looking skyward through the canopy of towering trees, some of which are 80-100 years old, visitors may catch a glimpse or at the least hear the sounds of barred owl (*Strix varia*), pileated woodpecker (*Dryocopus pileatus*), prothonotary warbler (*Protonotaria citrea*), Acadian flycatcher (*Empidonax virescens*), northern parula (*Setophaga americana*) and hooded warbler (*S. citrina*). Two areas within the COWASEE Basin, the Congaree National Park and the Upper Santee Swamp, have been recognized as "Globally Important Bird Areas" by the National Audubon Society because of their outstanding bird values. Some of the highest wintering songbird densities ever recorded in the United States have been observed in this basin, having more than 5,100 birds per square mile. Water birds take refuge in the wetlands of the COWASEE Basin including yellow-crowned night heron (*Nyctanassa violacea*), great egret (*Ardea alba*), great blue heron (*A. herodias*), little blue heron (*Egretta caerulea*), cattle egret (*Bubulcus ibis*), white ibis (*Eudocimus albus*), anhinga (*Anhinga anhinga*) and double-crested cormorant (*Phalacrocorax auritus*).

During its post-breeding dispersal from coastal rookeries, the federally threatened wood stork forages in the numerous shallow pools and wetlands of the COWASEE Basin. Poinsett State Park is home to several breeding colonies of the federally endangered red-cockaded woodpeckers (*Picoides borealis*). White-tailed deer (*Odocoileus virginianus*) and wild turkey (*Meleagris gallopavo*) are frequent inhabitants along the floodplain with the occasional black bear (*Ursus americanus*) making its appearance as it travels the river corridor. Venturing out after dark, one may spot several bat species including the Rafinesque's big eared bat (*Corynorhinus rafinesquii*), hoary bat (*Lasiurus cinereus*), big brown bat (*Eptesicus fuscus*) and Southeastern myotis (*Myotis austroriparius*) in search of moths and mosquitoes.

Rare plant species within COWASEE Basin may include cypress knee sedge (*Carex decomposita*), Carolina birds-in-the-nest (*Macbridea caroliniana*), and lobelia (*Lobelia spp.*). Other rare species that may occur in these habitats are listed in Appendix 2 from the 2015 South Carolina State Wildlife Action Plan (2015 SC SWAP).

6. Aquatic Resources

The Congaree, Wateree and Upper Santee rivers that are the predominant features within the COWASEE Basin are part of the Santee River drainage, the largest river drainage in South Carolina covering approximately 16,795 square miles. Beginning in the mountains of North Carolina, the Catawba River flows from North to South Carolina into Lake Wylie becoming the Wateree River where the Catawba

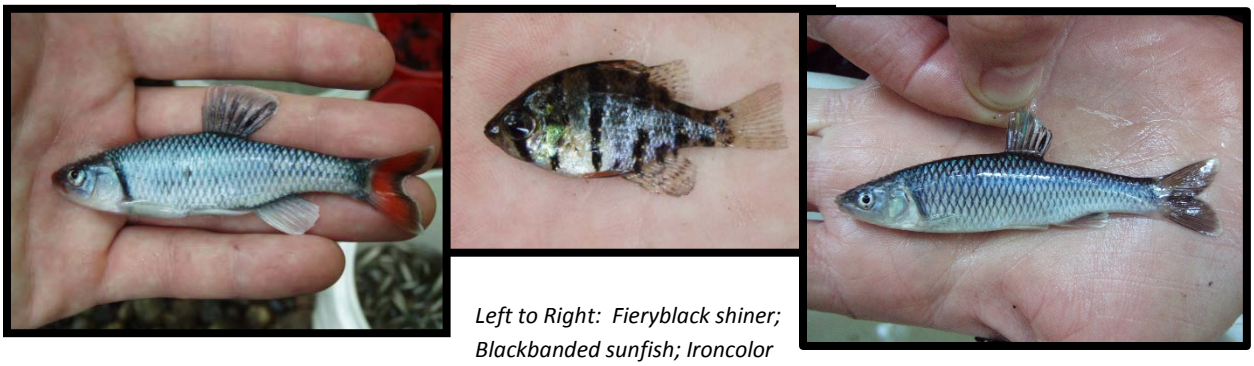
connects with Big Wateree Creek in northeastern Fairfield County. The Wateree flows through Lake Wateree and exits below the dam winding for approximately 77 miles through the Sandhills and upper Coastal Plain where it converges with the Congaree River system to form the Santee River which flows for only five miles before entering Lake Marion. The Congaree, slightly smaller in comparison to the Wateree at about 46 miles long, forms within the inner Coastal Plain from the confluence of the Broad and Saluda rivers.

Top: Seagreen darter; Bottom: Sandhills chub

South Carolina's waterways contain 137 native fish species and 22 introduced species, 12 of which are sport fish most often found in large impoundments. The Santee River drainage contains 11,699 miles of stream, 139,504 acres of lake area, 110 native fish species and 18 introduced fish species. The Santee drainage supports among the highest species diversity, relative to other drainages, and also the greatest total number of species on the Atlantic slope.

The streams and rivers in the COWASEE Basin are generally wadeable with low to moderate flow with patches of rooted aquatic vegetation and scattered woody debris. Sandy substrates dominate moderate flow areas; while mud, clay, silt and fine detritus comprise the substrate in low flow areas. Many of the streams transition in and out of swamps and wetlands in low lying areas. The larger, navigable rivers have substrates of shifting sand in flowing areas and deposits of silt, clay and finer materials in the pools.

The South Carolina Stream Assessment (SCSA) conducted by the SCDNR Freshwater Fisheries Section sampled eight wadeable streams within the Focus Area boundaries documenting three species of conservation priority including the sawcheek darter (*Etheostoma serrifer*), seagreen darter (*E. thalassinum*) and American eel (*Anguilla rostrata*). Twenty-one wadeable streams that flow into the Focus Area boundaries documented six priority species including the aforementioned darter species and the sandhills chub (*Semotilus lumbee*), flat bullhead (*Ameiurus platycephalus*), fieryblack shiner (*Cyprinella pyrrhomelas*) and blackbanded sunfish (*Enneacanthus chaetodon*); however, these species also occur



Left to Right: Fieryblack shiner; Blackbanded sunfish; Ironcolor shiner

within the focus area boundaries. Other studies conducted within and around Congaree National Park have identified the presence of six more conservation priority species within the COWASEE Basin, including the ironcolor shiner (*Notropis chalybaeus*), greenfin shiner (*C. chloristia*), lowland shiner (*Pteronotropis stonei*), snail bullhead (*A. brunneus*), swampfish (*Chologaster cornuta*), banded sunfish (*E. obesus*) and piedmont darter (*E. mariae*). Just north of the upper boundary of the COWASEE, Big Pine Tree Creek near the city of Camden contains one of the very few known populations of Carolina pygmy sunfishes (*Elassoma boehlkei*).

Another conservation priority species with an intriguing story, the robust redhorse (*Moxostoma robustum*) was once a common species in the Santee River drainage and other drainages from the Pee Dee River in North Carolina south to the Altamaha River in Georgia. First described in 1870, the species was thought to be extinct, but in 1991 two Georgia Department of Natural Resources employees collected an unknown sucker species in the Oconee River. Upon further examination, it turned out to be a robust redhorse. This signified the rediscovery of a species that had been lost to science for 121 years. A conservation committee was formed in 1995 to begin to understand the robust redhorse and seek out other existing populations in its historic range. In 2004, SCDNR began a project to establish a self-sustaining population of robust redhorse in the Santee River basin with brood stock from the Savannah River. Spawning efforts occurred every spring from 2004-2013 producing 15,000 eggs which resulted in the stocking of 11,000 fry into grow-out ponds. All fish stocked were tagged with coded wire or pit tags. Surveying efforts monitored the growth, survival, maturation and spawning success, as well as habitat preferences, of stocked robust redhorse in the Santee River basin. In 2009, a telemetry study was initiated in the Wateree and Congaree rivers. Fourteen fish were monitored during multiple years. All study fish utilized the Wateree Tailrace during spawning season and then the Lower Congaree River afterwards. Eleven of the fourteen fish traveled up the Congaree to at least the midway point; nine of the fourteen specimens passed upstream of Rosewood Landing; two were documented using the Broad River below the Columbia Dam; two fish used the lower Saluda and three fish were detected in the upper Santee River above Lake Marion. After spawning, robust redhorse migrating downstream from the Wateree into the lower Congaree exhibited an apparent temperature preference, as the Congaree is significantly cooler than the Wateree, making these waters within the COWASEE Basin important for this conservation priority species.

Robust redhorse

SCDNR Freshwater Fisheries staff has limited data from the Congaree and Wateree rivers. A study was conducted from 1984-1987 to establish baseline data of fish populations within the Wateree River from the Lake Wateree Dam to the confluence of the Congaree and to determine impacts of an industrial discharge in the river. Over the course of the study using boat electrofishing techniques, 5,097 fish were collected that represented 37 species from 12 families which are listed in Appendix 3.

In 1997, SCDNR staff were asked to assist Congaree Swamp National Monument (now known as Congaree National Park) by conducting surveys in Cedar Creek at Wise Lake, South Cedar Creek Road and Red Bluff Road and in Weston and Wise lakes to determine the effects of fishing pressure, if any, and to describe the fish community. A total of 247 fish were collected representing 23 species from Wise Lake and a total of 144 fish were collected representing 15 species from Weston Lake on August 22, 1996. During October of that year, a total of 21 species were collected from Cedar Creek, 20 species at the Wise Lake site, 10 at the Red Bluff Road site and 8 at the South Cedar Creek Road sites. The species captured in this study are detailed in Appendix 4.

A similar study again was conducted by SCDNR staff from 1999-2002 to inventory the fish species within Congaree National Park and define the relative condition of the fish community. During this time, 59 surveys were completed, 50 of which were within Park boundaries and nine just outside. At the time of the study, the park experienced extreme drought conditions and the normal flooding events were rare. A variety of habitat types including ponds, oxbow lakes, guts, sloughs, flats and streams were sampled predominantly in the summer months; however, some samples were conducted in the spring. A total 56 fish species were collected, including 55 in the streams, guts and sloughs on the Park and 27 in the ponds and lakes. Compared to the 1997 study, 24 species were collected that were not previously reported. Over the course of the entire project, 59 species were collected from 59 samples at 42 locations, including nine streams outside the park boundaries (Appendix 4). From February to June 2003, major flood events occurred in these previously sampled areas; five of which were re-sampled eight times from June to October 2003. Similar species richness was observed at the sample sites pre- (38 species) and post-flood (37 species). Seven species (blackbanded sunfish, channel catfish [*Ictalurus punctatus*], flat bullhead, green sunfish [*Lepomis cyanellus*], piedmont darter, snail bullhead and spotted sucker [*Minytrema melanops*]) were only sampled during pre-flood sampling while seven species (bowfin [*Amia calva*], black crappie [*Pomoxis nigromaculatus*], carp [*Cyprinus carpio*], longnose gar [*Lepisosteus osseus*], mud sunfish [*Acantharchus pomotis*], pumpkinseed [*L. gibbosus*] and redear sunfish [*L. microlophus*]) were only collected during post-flood sampling.

The Southeastern United States sustains the greatest diversity of freshwater crayfish and mussels, with approximately 375 and 300 species respectively, in the world. Crayfish serve as a keystone species in the aquatic community as important prey items and scavengers, whereas mussels function not only as a prey base, but also as a facilitator to improve water quality by filtering large volumes of water to reduce excessive quantities of algae, nutrients, bacteria and organic material. There are 37 native mussel species in South Carolina, 28 of which are listed as priority conservation species in the 2015 SC SWAP.

Clearly, the variation in aquatic habitats from the main river to tributaries, sloughs, oxbow lakes and swamps provides a high diversity of aquatic life.

7. Hydrologic Resources

The COWASEE Basin is encompassed by the Santee River drainage which can then be further divided into three distinct sub-basins, the Catawba-Wateree, Congaree and Santee, as a part of the South Carolina State Water Assessment produced by SCDNR.

7.1 Catawba-Wateree Sub-basin

The Catawba-Wateree River Sub-basin parallels the course of the Catawba-Wateree River from the North Carolina border to the confluence with the Congaree. This system has six hydroelectric reservoirs in North Carolina and five in South Carolina, all owned by Duke Energy, affecting the natural flow of the Catawba-Wateree River. Due to these impoundments and the rapid development in the greater Charlotte area, the Catawba-Wateree River was declared by American Rivers in 2008 as one of America's Most Endangered Rivers. There are six gaging stations on the Catawba-Wateree including two within the COWASEE Basin boundaries, one on Colonel's Creek (Station 1483) and the other on the Wateree River (Station 1483.15). The Catawba River is well developed by the time it enters South Carolina at Lake Wylie. Average annual flow of the Catawba-Wateree River ranges from 4,226 cubic feet per second (cfs) near Rock Hill to 6,080 cfs near Camden. Streamflow can be expected to equal or exceed 894 cfs near Rock Hill and 1,230 cfs near Camden 90 percent of the time. The lowest recorded flow on the main stem (132 cfs) occurred near Rock Hill in 2002 during the 1998–2002 drought. The highest flood flow on record (estimated at 400,000 cfs) was recorded near Camden in 1916. Daily streamflows near Camden are more variable than elsewhere along the river because of fluctuating releases from Lake Wateree. Due to these variable fluctuations and the resulting low flows, the downstream portion of the Wateree River may limit some water-use activities.

Tributary streams to the Catawba-Wateree Sub-basin are largely unregulated and flows rarely exceed 1,000 cfs. On Colonel's Creek, the average annual streamflow is 43 cfs and streamflow is expected to equal or exceed 18 cfs 90 percent of the time. Located in the upper Coastal Plain, Colonel's Creek has highly permeable soils, subsurface sediments and is generally deeply incised resulting in well-sustained flows during periods of low rainfall, making it a reliable index of surface-water flow.

The waters of the Catawba-Wateree Sub-basin provide suitable water for aquatic life, recreation, drinking water, fishing, industry and agriculture and are designated by SCDHEC as "Freshwater." As a part of their

Watershed Water-Quality Assessment program, SCDHEC sampled 113 surface-water sites in the Sub-basin in 1998 and 2002 in order to assess suitability for aquatic life and recreational use. Aquatic-life uses were

Table 2. Water quality impairments in the COWASEE by Sub-basin from the SCDNR State Water Assessment.

CATAWBA-WATEREE SUB-BASIN				
Water Body Name	**Station Number**	**Use**	**Status**	**Water Quality Indicator**
Swift Creek	CW-238	Aquatic Life	Non-supporting	Dissolved Oxygen
SANTEE SUB-BASIN				
Water Body Name	**Station Number**	**Use**	**Status**	**Water Quality Indicator**
Halfway Swamp Creek arm of Lake Marion	SC-038	Aquatic Life	Non-supporting	Total phosphorous
Spring Grove Creek	SC-009	Recreation	Non-supporting	Fecal coliform
Stream upstream of Safety Kleen, Pinewood	SC-058	Aquatic Life	Non-supporting	pH
CONGAREE SUB-BASIN				
Water Body Name	**Station Number**	**Use**	**Status**	**Water Quality Indicator**
Reeder Point Branch	C-073	Aquatic Life	Non-supporting	Dissolved oxygen, pH
	C-073	Recreation	Non-supporting	Fecal coliform
Toms Creek	C-579	Aquatic Life	Partially Supporting	Macroinvertebrates
	C-072	Recreation	Partially Supporting	Fecal coliform

fully supported at 58 sites, or 51% of the water bodies sampled in this Sub-basin; most of the impaired water exhibited high phosphorous levels, poor macroinvertebrate community structures and dissolved oxygen levels below the concentrations needed to support aquatic life. Recreational use was fully supported in 38% of the sampled water bodies; the water bodies that did not support recreational use exhibited high levels of fecal-coliform bacteria (Table 2).

The southeastern portion of the Catawba-Wateree Sub-basin encompasses the upper boundary of the COWASEE Basin. This area is a good source of groundwater due to the sedimentary deposits of the Upper Coastal Plain where it is underlain by the Middendorf, Black Creek and Tertiary sand aquifers.

Southeastern Kershaw County, eastern Richland County and northwestern Sumter County are in the outcrop area of the Middendorf Formation and, therefore, are the recharge area of the Middendorf Aquifer. The Tertiary Aquifer overlies the Black Creek and is the principal source of water for domestic supplies in the high-elevation areas outside the river valley. Due to high iron concentrations, common in the Middendorf Aquifer, wells in both Sumter and Richland counties are known to have problems from iron-reducing bacteria which may block well screens and produce "red water." Low pH in these areas can corrode steel and brass well screens too. Groundwater within this Sub-basin is not routinely monitored as ground-water use in the Sub-basin is very limited. Most of the lower part of the Catawba-Wateree system is within the Upper Coastal Plain within the recharge areas for the Middendorf and Black Creek aquifers where no known groundwater level problems exist or are associated with pumping from these aquifers.

Water use within this Sub-basin is summarized in Table 3. Offstream water use in the Catawba-Wateree River Sub-basin totaled 274,922 million gallons in 2006, ranking it fourth among the 15 Sub-basins; 99 percent of water used was from a surface water source and the remaining from groundwater sources. Hydroelectric facilities accounted for 84% of the total water use, followed by industry (10%) and water supply (6%). Small quantities of water were also used for agricultural irrigation, golf courses and mining. Consumptive use in this Sub-basin is estimated to be 10,459 million gallons or about 4% of the total offstream use.

Table 3. Reported water use in the Catawba-Wateree River Sub-basin for the year 2006 from the SCDNR State Water Assessment.

Water-use Category	Surface Water		Ground Water		Total Water	
	Million gallons	% of total surface water use	Million gallons	% of total ground water use	Million gallons	% of total water use
Aquaculture	0	0	0	0	0	0
Golf Course	297	0.1	169	7.7	465	0.2
Industry	25,849	9.5	889	40.3	26,738	9.7
Irrigation	361	0.1	432	19.6	794	0.3
Mining	0	0	14	0.6	14	0
Other	0	0	0	0	0	0
Thermoelectric Power	229,787	84.3	0	229,788	83.6	0
Water Supply	16,424	6	700	31.8	17,124	6.2
Total	272,718		2,204		274,922	

7.2 Congaree Sub-basin

The Congaree Sub-basin is the state's smallest of the 15 Sub-basins encompassing Richland, Lexington and Calhoun counties located primarily in the Upper Coastal Plain. The main watercourse within this Sub-basin is the Congaree River; much of the Congaree River and lower portions of tributary streams are associated with swamplands.

Streamflow is monitored at five sites, one of which is within the COWASEE Basin boundaries at Cedar Creek (Station 1696.7). The Congaree River daily flow may be highly variable due to hydroelectric facilities upstream on the Saluda and Broad rivers, but the minimum available flow is still significant and reliable year round. Average annual flow of the Congaree at Columbia is 8,872 cfs, with at least 2,820 cfs 90% of the time.

Tributary streams on opposite sides of the Congaree vary in their streamflow characteristics with the western side (such as Congaree and Big Beaver creeks) exhibiting nearly constant streamflows and an excellent source of water supply; whereas the creeks on the eastern side are typical of middle Coastal Plain streams with moderately-sustained flows. The eastern side streams are characterized by nearly impermeable, red, clayey sand which limits flow. Gills Creek is the exception to the moderate flow regime

as it has several flood control structures and recreational impoundments that affect natural streamflow. Congaree Creek has the most regular year round streamflow of any gaged-stream in South Carolina.

The waters of the Congaree Sub-basin provide suitable water for aquatic life, recreation, drinking water, fishing, industry and agriculture and are designated by SCDHEC as "Freshwater." As a part of the Watershed Water-Quality Assessment program, SCDHEC sampled 30 surface-water sites in the Sub-basin in 1997 and 2001 in order to assess suitability for aquatic life and recreational use. Aquatic-life uses were fully supported at 23 sites, or 77% of the water bodies sampled in this Sub-basin; most of the impaired water exhibited dissolved oxygen levels below the concentrations needed to support aquatic life. Recreational use was fully supported in 52% of sampled water bodies; water bodies that did not support recreational use exhibited high levels of fecal-coliform bacteria (Table 2).

The Sub-basin is entirely in the Coastal Plain and underlain throughout by the Middendorf Aquifer. The upper reaches of the Sub-basin are in the outcrop areas of the Middendorf and Black Creek aquifers. There are higher iron concentrations in areas of Calhoun County where the Tertiary sand aquifer crops out, but yields good water. There is also naturally occurring radioactive groundwater in the Sub-basin.

Water use within this Sub-basin is summarized in Table 4. Offstream water use in the Congaree River Sub-basin totaled 32,179 million gallons in 2006, ranking it tenth among the 15 Sub-basins. Surface water sources contributed to 95% of water used with the remaining from groundwater sources. Industry

Table 4. Reported Water Use in the Congaree River Sub-basin for the year 2006 from the SCDNR State Water Assessment

Water-use Category	Surface Water		Ground Water		Total Water	
	Million gallons	% of total surface water use	Million gallons	% of total ground water use	Million gallons	% of total water use
Aquaculture	22	0.1	15	1	37	0.1
Golf Course	288	0.9	38	2.5	326	1.0
Industry	29,956	97.7	564	37.1	30,520	94.8
Irrigation	1	0	150	9.9	151	0.5
Mining	392	1.3	318	20.9	710	2.2
Other	0	0	0	0	0	0
Thermoelectric Power	0	0	0	0	0	0
Water Supply	0	0	435	28.6	435	1.4
Total	30,659		1,520		32,179	

accounted for 95% of the total water use, followed by mining (2%) and water supply (1%). Small amounts of water also were used for golf courses, irrigation and aquaculture use. Consumptive use in this Sub-basin is estimated to be 3,635 million gallons or approximately 11% of the total offstream use.

7.3 Santee Sub-basin

The Santee River Sub-basin transects the middle and lower parts of the Coastal Plain extending from the confluence of the Congaree and Wateree rivers to the Atlantic Ocean. The Santee River formed from the Congaree and Wateree rivers, in its original form, is the fourth largest in average flow of any river on the Atlantic Coast. With periodic flooding, the river once nourished an extensive network of swamplands. With the construction of the Wilson Dam in 1941, much of the Upper Santee River became a part of Lake Marion, part of which is encompassed in the COWASEE Basin Focus Area.

Prior to the development of the Santee-Cooper lakes system, the average annual streamflow was 15,400 cfs and could be expected to exceed 7,000 cfs 90% of the time. Currently, there are five gaging stations monitoring river elevation, all of which are below the COWASEE Basin boundaries. There are no stream gage flows on tributaries in this system. The Upper Santee River portion of Lake Marion and the lake as a whole are used for recreation and hydropower production; as such, water is frequently withheld in the reservoir in accordance with the Santee-Cooper Federal Energy Regulatory Commission license mandating certain pool levels over the annual cycle. Occasional discharge of large volumes of water relieves the lake of floodwater inflow from upstream.

Tributary streams are typically unreliable sources of water due to fluctuations and no flow conditions during periods of drought. However, tributaries in the upper portion of this Sub-basin may be less variable due to groundwater support, thus providing a more reliable source of surface water supply.

The waters of the Santee Sub-basin provide suitable water for aquatic life, recreation, drinking water, fishing, industry and agriculture and are designated by SCDHEC as “Freshwater.” As a part of the Watershed Water-Quality Assessment program, SCDHEC sampled 63 surface-water sites in the Sub-basin in 1998 and 2002 in order to assess suitability for aquatic life and recreational use. Aquatic-life uses were fully supported at 44 sites, or 70% of the water bodies sampled in this Sub-basin; most of the impaired water exhibited pH problems or high phosphorous concentrations. Recreational use was fully supported in 75% of the sampled water bodies; the water bodies that did not support recreational use exhibited high levels of fecal-coliform bacteria (Table 2). The herbicides atrazine, simazine and tebuthiuron have been detected in almost every stream in the Santee sub-basin, including those in forested areas; however, concentrations are below the guidelines that protect aquatic life and drinking water from year-to-year.

The Sub-basin is entirely in the middle and lower Coastal Plain and underlain by the Middendorf Aquifer that supports large wells, but it is too deep for utilization as a water source by most users. As mentioned in the Congaree Sub-basin, many of the sites may have iron concentrations higher than recommended limits. The Black Creek Aquifer is the primary aquifer for the Santee River Sub-basin.

Water use within this Sub-basin is summarized in Table 5. Offstream water use in the Congaree River Sub-basin totaled 1,743 million gallons in 2006, ranking it last among the 15 Sub-basins. Groundwater withdrawal constituted 84% of water used with the remainder from surface water sources. Water supply and irrigation both accounted for 40% of the total water use, followed by industry and golf course each with 10% of the usage. Consumptive use in this Sub-basin is estimated to be 877 million gallons or about 50% of the total offstream use.

Table 5. Reported water use in the Santee River Sub-basin for the year 2006 from the SCDNR State Water Assessment.

Water-use Category	Surface Water		Ground Water		Total Water	
	Million gallons	% of total surface water use	Million gallons	% of total ground water use	Million gallons	% of total water use
Aquaculture	0	0	0	0	0	0
Golf Course	107	37.6	65	4.4	172	9.8
Industry	52	18.1	134	9.2	186	10.7
Irrigation	126	44.3	562	38.6	688	39.5
Mining	0	0	3	0.2	3	0.2
Other	0	0	0	0	0	0
Thermoelectric Power	0	0	0	0	0	0
Water Supply	0	0	694	47.6	694	39.8
Total	286	1,457	1,520		1,743	

According to SCDHEC's online Watershed Atlas tool, there are 12 National Pollutant Discharge Elimination System (NDPES) permits and three approved Total Maximum Daily Load (TMDL) areas within all of the COWASEE Basin boundaries (Table 6). The TMDLs all lie on the COWASEE Basin boundary on Spears and Warley creeks due to fecal coliform and Gills Creek due to dissolved oxygen levels and fecal coliform. High fecal coliform levels in Spears and Warley creeks likely are due to expanding, uncontrolled populations of feral hogs (*Sus scrofa*). SCDHEC has assigned fish consumption advisories on the Wateree, Congaree and upper Santee rivers. On the Wateree River, from the Lake Wateree Dam downstream to the Congaree River, only one meal per month should consist of blue or channel catfish. Bowfin, flathead catfish and largemouth bass should be limited to one meal per week due to mercury and PCBs. The Congaree River to the South Santee River has a mercury advisory and bowfin and largemouth bass should be limited to

one meal per week. For more detail on the sites listed as a part of SCDHEC's Watershed-Water Quality Assessment, visit http://gis.dhec.sc.gov/watersheds/

Table 6. NPDES Permits within the COWASEE Focus Area boundaries.

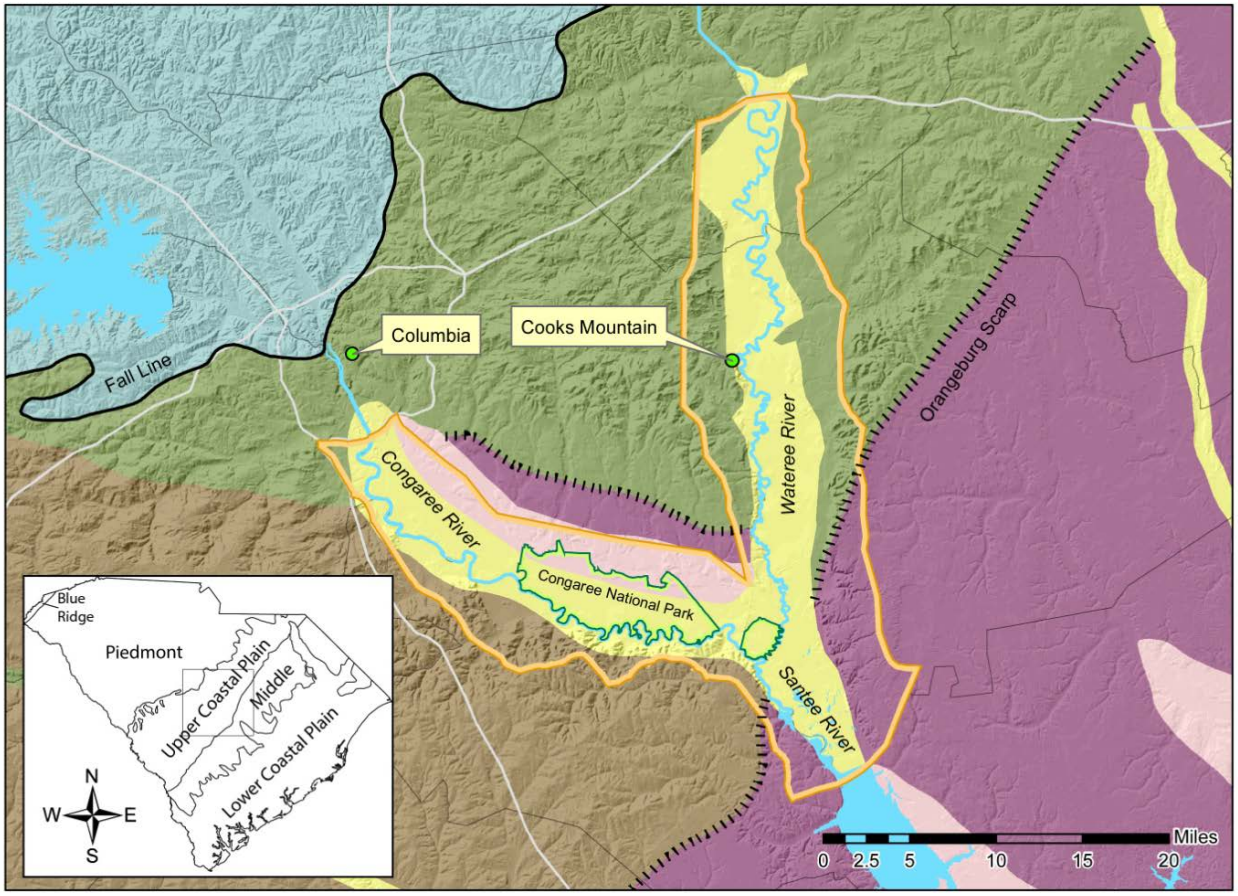
Permit #	Type	Name
SC0038865	Municipal	East Rich Co PSD/Gills Creek
SC0001333	Industrial	Eastman Chemical/SC Operations
SC0001848	Industrial	Westinghouse Electric LLC/Columbia
SC0033367	Industrial	Devro Inc./Coria Division
SC0042170	Industrial	Pinewood Site Custodial Trust
SC0046868	Municipal	Town of Pinewood
SC0002038	Industrial	SCE&G/Wateree Station
SC0047902	Industrial	FINNCHEM USA Inc
SC0038121	Industrial	International Paper/Eastover
SC0033235	Domestic	South Forge Apartments
SC0024970	Industrial	U.S. Air Force/Shaw Air Force Base
SC0045349	Domestic	S.C. Dept. of Corrections/Wateree River

8. Geological Resources

8.1 Basin Location

The COWASEE Basin covers 491 square miles and is located south and east of Columbia in the Upper and Middle Coastal Plain physiographic provinces (Figure 1). These provinces trend roughly parallel to the modern coastline (SW-NE). The inland limit of the Upper Coastal Plain is the Fall Line, and northwest of that are the crystalline rocks of the Piedmont. The seaward limit of the Upper Coastal Plain is the toe (foot or base) of the Orangeburg Scarp. The Middle Coastal Plain abuts the Upper Coastal Plain along the Orangeburg Scarp, and its seaward limit (east of the COWASEE Basin) is the toe of the Surry Scarp.

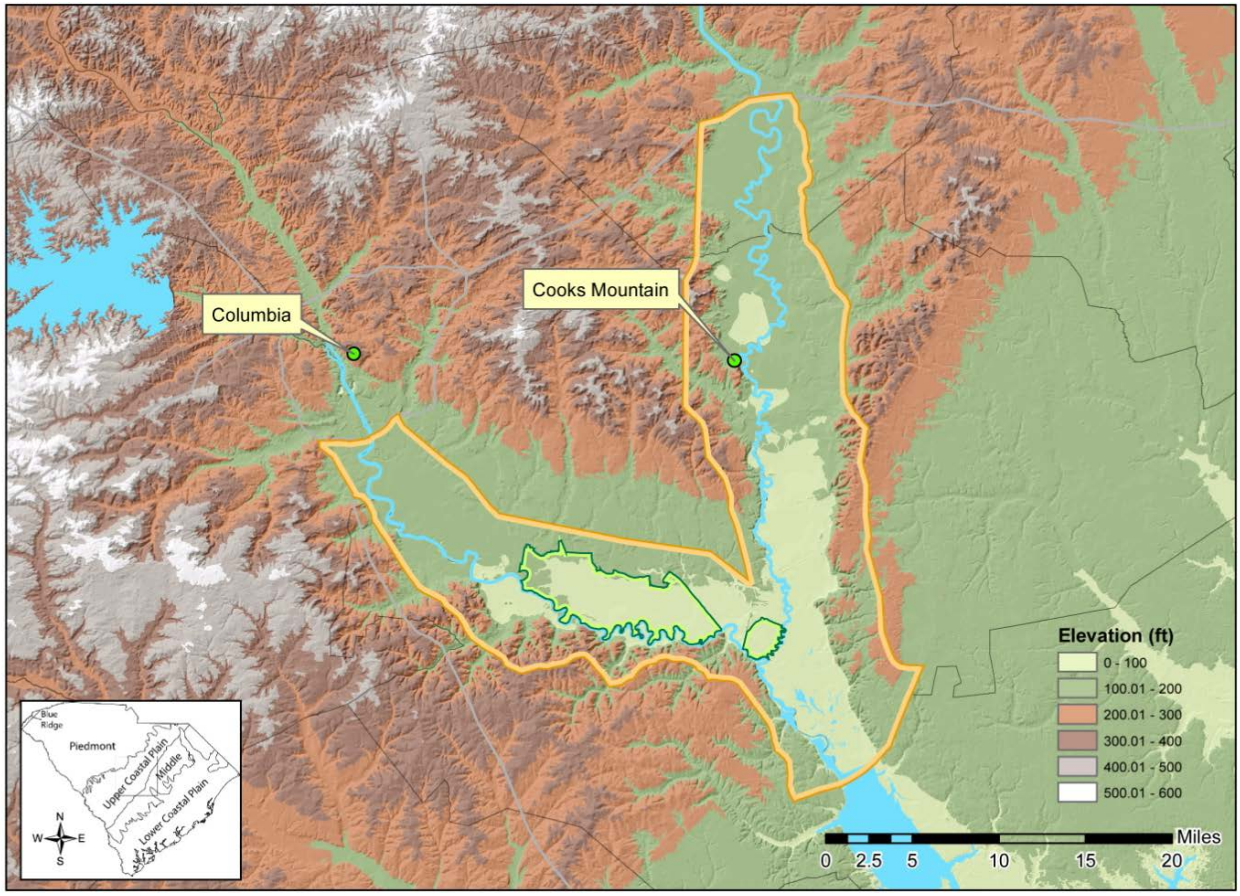
Figure 1. Regional geologic map and extent of COWASEE basin. Unit colors: Piedmont (blue), Cretaceous (green), Eocene (brown), Pliocene (purple), Pleistocene (pink), recent (yellow).



8.2 Topographic Relief

The Upper Coastal Plain is composed of older sedimentary deposits and is more dissected by erosion, resulting in an irregular surface with greater topographic relief compared to the Middle Coastal Plain. The highest elevations in the Upper Coastal Plain are approximately 600 feet above mean sea level with the lowest elevations around 230 feet above mean sea level. The Congaree and Wateree rivers have down cut through the Upper Coastal Plain creating high bluffs along the Wateree, at approximately 420 feet above mean sea level, and the south side of the Congaree, 350-370 feet above mean sea level. Along the north side Congaree River Valley, the bluffs are much more subdued with elevations of 130 -140 feet. The Middle Coastal Plain contains younger sedimentary deposits and the topography is more subdued, with relief ranging from 270 feet above mean sea level at the Orangeburg Scarp to 130 feet above mean sea level at the southeastern edge of the map with bluffs along the Santee River at 75 feet above mean sea level.

Figure 2. Topographic map of area surrounding COWASEE basin.



8.3 Fluvial Systems

Both the Congaree and Wateree rivers have source areas originating in the Piedmont. While they flow in the Piedmont, they have low sinuosity values (i.e. nearly straight stream courses). As these rivers exit the Piedmont and flow onto the lower slope of the Coastal Plain, they begin meandering. The strength and cohesiveness of Coastal Plain material is significantly less than the Piedmont allowing greater lateral erosion. Over time, geological processes have tilted the entire region toward the south-southeast causing the Congaree River to cut down and into its south side, creating an asymmetric valley with steep bluffs on the south side. There is a gentle incline from the river northeastward to the uplands across several broad older river terraces. Because the tilting is approximately in the same direction as the Wateree River drainage, the Wateree River valley is fairly symmetrical with high bluffs on both sides with a wide floodplain. Both the Congaree and Wateree rivers transport large amounts of sediment downstream to the Santee River which moves that sediment farther downstream. However, since the Santee River was dammed to form Lake Marion, the natural hydrodynamics of the river have been altered. The damming

has caused the stream velocity to drop off, and as a result much of the sediment drops out at the top of the lake forming and ultimately filling Sparkleberry Swamp.

8.4 Younger Features

On the more level surfaces of the Upper and Middle Coastal Plain, there are several much younger features. The first are Carolina Bays. These are elliptical features recognizable on aerial photographs and LiDAR. They tend to be elongated northwest to southeast and are more common on Middle Coastal Plain surfaces. Many Carolina Bays pond water because of clayey layers just beneath the surface, and because of this effect they have been drained for agriculture, intensive forest management or other development. Other young features are Eolian sand sheets and dunes in areas of Manchester State Forest, Pinewood, and Rimini along the north side of the Santee River to as far east as Interstate-95. These produce a rippled land surface with very poor agricultural value due to the very well-drained soils and low organic content.

8.5 Scarps

The Orangeburg Scarp is a surface feature that is traceable from Georgia to Virginia. In South Carolina there is more than six feet of relief along this contact. The elevation of the toe (foot or base) of the Orangeburg Scarp is 180-230 feet above mean sea level. It is also the dividing line at the surface between the Eocene and older strata (Upper Coastal Plain) and the Pliocene and younger strata (Middle Coastal Plain) and represents a former ocean shoreline from 3-2.5 million years ago.

8.6 Sediments

The metamorphic crystalline rocks of the Piedmont are a major source of sediments entering the COWASEE Basin. Another source is the cannibalization of preexisting sediments of the Upper and Middle Coastal Plain and the existing flood plains. The Upper Coastal Plain is composed of gravel, sand, silt, clay and fossils of Cretaceous to Eocene age (145-34 million years ago). These sediments were deposited in fluvial and marine environments. The Eolian sand of the “Sand Hills” is remobilized water-borne sediment. Except for the Sand Hills, Upper Coastal Plain deposits tend to be cohesive with the silt and clay acting as binders, i.e. semi-lithified. This lithification effect allows the formation of steep slopes. The gravel is composed of lithic fragments and quartz. The sand is predominately quartz with minor amounts of heavy minerals. Some feldspar is in river deposits. The amount of silt and clay varies from little to none in beach sand to almost entirely fine material in oxbow lake deposits, river meanders and subaqueous low-energy deposits of flood plains and freshwater marshes. Intermittently the groundwater chemistry has cemented some of the sediments with silica, iron oxide or calcium carbonate. Not shown on the map, but common to both provinces, are Paleocene sediments (66-56 million years ago). These are fine sand, silt and clay with minor fossil plant material (lignite) and fossil shells. The interpreted environment of formation is a large, shallow body of water similar to the Pamlico Sound in North Carolina or the Chesapeake Bay in Virginia. Some of that material is fossil shell that was converted from calcium carbonate to silica by ground water after burial, but the shell structures remain recognizable. At Poinsett State Park, the rocks at the entry gate are made from this material.

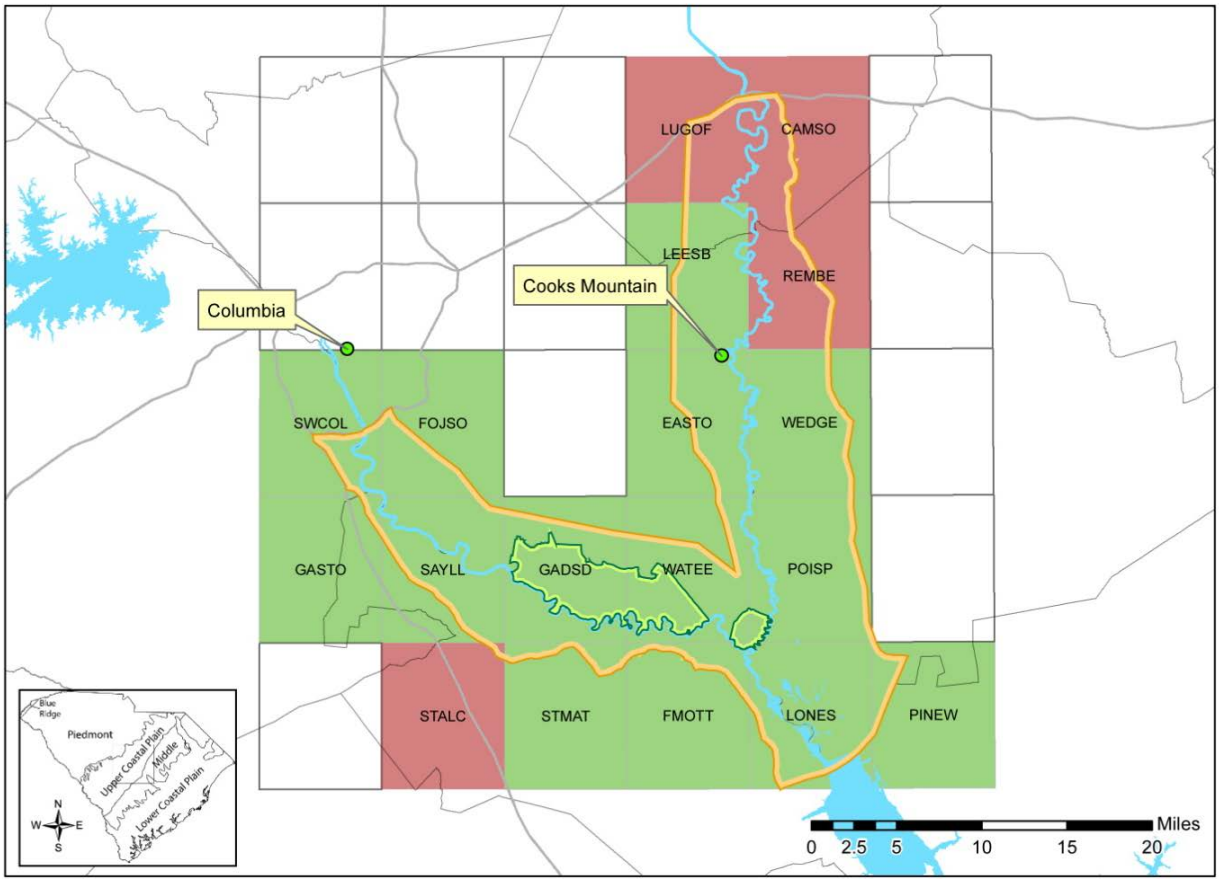
The Middle Coastal Plain is composed of gravel, sand, silt, clay, calcareous sediment, limestone and peat of Pliocene to Pleistocene age (5.3 million-12 thousand years ago). These are mostly ocean sediments with fluvial sediment in stream valleys. The ocean sediments were deposited during multiple changes in sea level over a shorter time frame than the marine Eocene sediments. Where the Congaree River Valley cuts into the Upper Coastal Plain, some Pliocene sediment was deposited as either flood plain or estuarine deposits. This upstream encroachment of Pliocene deposits results in the finger-like pattern of sediment up the Congaree River Valley. The youngest sediments are Pleistocene to present day (2.6 million years and younger). These are mostly fluvial sediments with some estuarine sediments composed of fossils, sand, silt and clay having a finger-like pattern along the river systems since they accumulated in the river valleys.

8.7 Geologic Resources

The various sizes and shapes of the Coastal Plain sand can provide deposits useful for many industries from fill sand to industrial silica. Deposits of Fullers Earth have agricultural and industrial uses, and have been found along the east side of the Wateree River in road exposures. If clay content is high enough, it can be used as pond linings or local confining units. Some of the cemented or chemically altered rocks have been useful as dimension stone. This material often is along the base of the bluff on the east side of the Wateree River, and it has been mined along the southwest side of the Santee River floodplain.

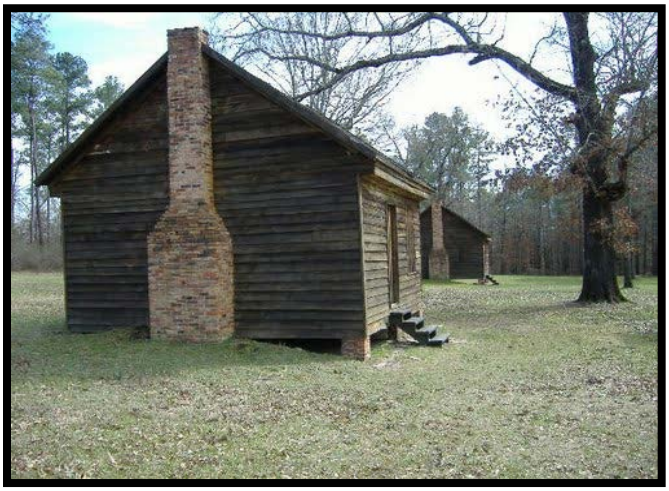
The basic scale of detailed geologic mapping (1:24,000) is in 7.5-minute quadrangles. The COWASEE Basin includes a total of 18 geologic maps (Figure 3). Fourteen quads have been mapped. Three of the four unmapped quads are in the upper Wateree River Valley. Of the 491 square miles in the basin, 419.4 square miles have been mapped. In addition, there is a detailed geologic map (1:12,000) of the Congaree River in the area of the National Park. Further information about geologic maps is available at: www.dnr.sc.gov/geology.

Figure 3. Available geologic maps in COWASEE basin: green quadrangles are mapped; red quadrangles are not mapped.



9. Cultural Resources

The coastal plain of South Carolina experienced concentric growth from the 1670 settlement of Charles Towne. Large plantations utilizing slave labor dominated the economy with wealthy landowners acquiring thousands of acres of land through royal grants. The "backcountry" became a desired settlement as the fear of Native American attacks and slave rebellions grew. In 1730, the first Royal Governor of the colony, Robert Johnson, established a plan to create townships along major rivers inland, resulting in eight new settlements at the edge



of the coastal region. The areas of the midlands around the Broad, Saluda and Congaree rivers was settled by 1740 by small immigrant farmers rearing cattle, hogs, corn and indigo for sale in Charles Towne. These immigrants were a mixture of Germans, Scots, English and Welsh who arrived from Charles Towne or who emigrated from Pennsylvania, Maryland and Virginia in search of better land and a haven from the threat of Native Americans.

Native Americans from the Catawba, Congaree and Cherokee Nations utilized the riverbanks of the COWASEE Basin. In the early 1700s, there was a trading post, called Fort Congaree, located on the west bank of the Congaree River and along the northwest bank of Congaree Creek where deer skins and other items were traded with Native Americans for guns, munitions, blankets and other goods. European settlers soon abandoned the fort and the trade system in 1722 due to the rising threat of conflict with Native Americans. Settlers soon established another fort, northwest of the previous, as New Fort Congaree in 1748 to provide refuge for local settlers and restoring additional trade. This fort once served as a refuge for settlers from the Piedmont that were being raided by Cherokees and other Native Americans who had killed several people and cattle. Along with the establishment of New Fort Congaree, Joyner's Ferry and Friday's Ferry were constructed, in 1746 and 1748 respectively, to enable settlers to access both sides of the Congaree River. Joyner's Ferry was located near the confluence of the Wateree and Congaree and Friday's Ferry on the northwest at Saxe-Gotha just below the Fall Line rapids. By 1754, settlement began on the east bank known as East Granby and a road was developed on the east of the Congaree connecting the two ferries. There were several other private ferries created throughout the Congaree Valley including Huger's and Zeigler's that would have been located in the present day's Congaree National Park.

As the Revolutionary War began there was little fighting within the Congaree Valley, other than two brief skirmishes. In 1780, the British established a fort in the town of Granby, probably to control the ferry traffic. This fort was attacked in 1781 via the ferry and captured from the British after two days of fighting, although the command of the fort was lost and retaken several times. Thirty miles southeast of the Granby settlement, the British took possession of the home of Rebecca Motte, transforming it into a fortified garrison with a deep trench and an elevated parapet. The Motte residence was beneficial for the British as it overlooked the confluence of three roads that led to Camden on the Wateree River, northwest to Columbia and south to Charleston. The Camden Road also led to McCord's Ferry to cross the Congaree River, making the home of Rebecca Motte a post to monitor traffic moving in the area. General Francis Marion besieged the post at Fort Motte which resulted in partial destruction of the house with fire and a short musket fire exchange.

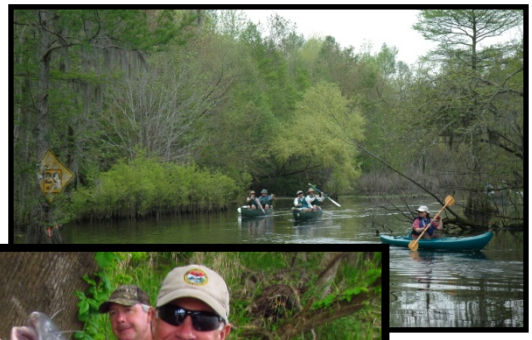
Wealthy planters soon moved into the area around the first half of the nineteenth century bringing the first plantation system to the area. Much of the swampland along the rivers was used for farming. Using slaves, planters cleared land and built dikes and dams to control periodic flooding in an attempt to grow indigo, cotton and tobacco in the swampland. However, many planters were deterred from trying as the swamps were disease-ridden and it required a large number of slaves to convert the land to agriculture and control the flooding. Several dike systems were constructed during this time including the dike system

started by James Adams, the Northwest Boundary Dike, and the Dead River Dike or Southwest Boundary Dike, constructed around 1840 by Paul Spigner. The most significant diking of the Wateree River swamp occurred at Goodwill Plantation (Wateree River Heritage Preserve) where Nathaniel Heyward farmed approximately 1,000 acres of rice.

The swamps of the COWASEE Basin were also important areas for farming livestock too. To prevent flooding, earthen mounds were created for grazing animals. Hogs, cattle and sheep were also allowed to free-range the woods and clearings. They would be gathered in the fall for sale. Most of the cattle mounds created in Congaree Swamp were constructed between 1800 and 1900 using slave labor. Brady's Cattle Mound was constructed around 1900 and was still used for its original purpose in 1980. Attempts at large-scale farming and settlement in the Congaree Swamp failed, leaving bottomland hardwood forest. Logging began in the Congaree Valley in the late 1800s targeting predominantly cypress and later bottomland hardwood. However, the operations were short lived.

Currently the COWASEE Basin has 28 sites on the National Register of Historic Places including four National Historic Landmarks and one National Historic District at Stateburg, the geographic center of the state and once planned to be the site of the state capitol. The COWASEE Basin is the site of the first exploration of interior North America with the arrival of the Spanish explorer Hernando de Soto in 1540 on his search for the Indian town of Cofitachequi. The English explorer, John Lawson, traveled through the high hills of the Santee and described an "alp with a top like a Sugar-loaf" which may have been the first written description of Cooks Mountain. The COWASEE Basin was the scene of several battles and skirmishes during the Revolutionary War. The peace and prosperity following the war led to the establishment of large planter estates founded on rice and cotton production, such as Kensington, Millford, Mulberry and Goodwill plantations. Basin Landing on the Wateree at Goodwill Plantation was the hub of midlands agricultural commerce shipping products to Charleston for lucrative European export. Cultural and historic resources of the COWASEE Basin are exemplary, worthy of protection and additional documentation.

10. Recreation



The wetlands and waterways of the COWASEE Basin long have been known to sportsmen as providing unparalleled hunting, fishing and boating opportunities, but naturalists, birders, photographers, hikers and canoeists also have discovered the many scenic attributes of rivers, marshes and swamps of the COWASEE Basin.

Those ready for an adventure can hike for 27 miles on the Palmetto Trail in the COWASEE Basin, traversing from Hickory Top to crossing the

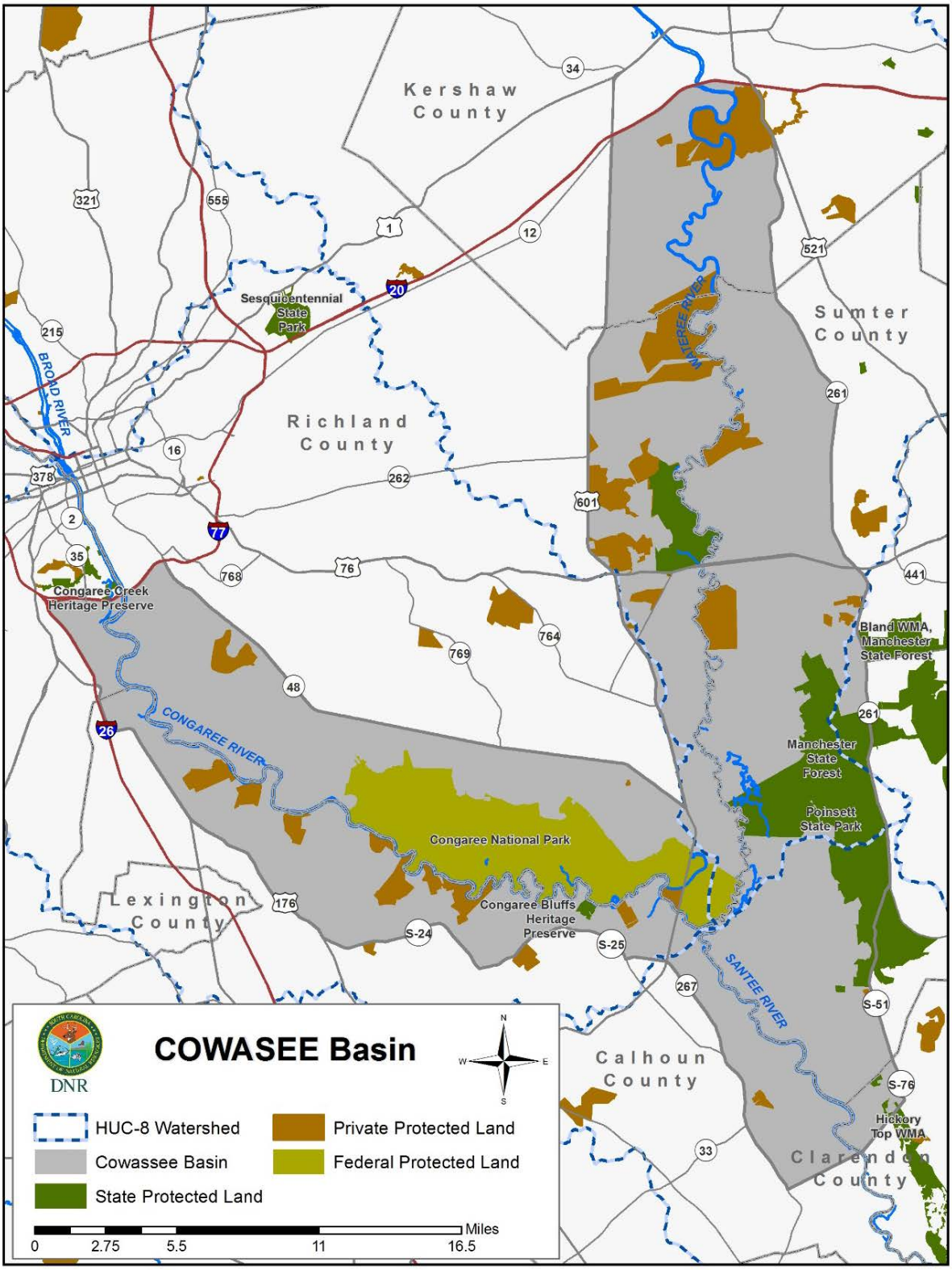
Wateree River and exploring 25 miles of trails within Congaree National Park; one can hike, camp and fish at Poinsett State Park; mountain bike throughout Manchester State Forest; and paddle Cedar Creek, the Congaree and Wateree rivers and Sparkleberry Swamp.

The COWASEE Basin has a strong and enduring hunting and fishing culture which can continue to be enjoyed at the Wateree River Heritage Preserve. The extensive bottomland forests are a significant wood duck production and wintering ground, and the Focus Area is now a priority waterfowl restoration area where several Focus Area partners are working with SCDNR to implement research and management to improve waterfowl habitat for resident, wintering and migratory populations of ducks and other waterbirds.

Abundant waters and wetlands provide for some of the finest freshwater fishing in the state. The rich waters of the COWASEE Basin are an outstanding fishery resource for catfish, sunfish, largemouth bass and striped bass.

Appendices

Appendix 1. COWASEE Basin Focus Area Map



Appendix 2. COWASEE Basin Species of Concern (Source: 2015 SC SWAP)

Table 1. Terrestrial priority species and their ecosystems: mammals.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Condylura cristata	Star-nosed Mole	G5	S3?	Of concern, State	High	swamps, marshes, bogs, streamsides; dense leaf litter
Corynorhinus rafinesquii	Rafinesque's Big-eared Bat	G3/G4	S2?	State Endangered	Highest	T-beam and I-beam bridges, abandoned buildings, old bunkers and tunnels, cavity trees, rock outcrops, mines, caves
Eptesicus fuscus	Big Brown Bat	G5	SNR		Highest	buildings, cavity trees, under bridges and in bat boxes; forage in open fields or forest gaps
Lasiurus borealis	Red Bat	G5	SNR		Highest	thinned stands; roost on smaller branches or twigs, often in the hardwood tree canopy; may roost in leaf litter
Lasiurus cinereus	Hoary Bat	G5	S?		Highest	tree cavities, trunks, tree foliage, squirrel nests, and Spanish moss
Lasiurus intermedius	Northern Yellow Bat	G4/G5	S?	Of concern, State	Highest	forage over open areas such as fields, pastures, golf courses, marshes, and along lake and forest edges; roost in clumps of Spanish moss or under old palm fronds
Lasiurus seminolus	Seminole Bat	G5	SNR		Highest	roost in large pines located near forested corridors; may roost in leaf litter
Mustela vison	Mink	G5	SNR		High	near swamps, streams, rivers, ponds, and saltwater marshes

Table 1. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Myotis austroriparius	Southeastern Bat	G3/G4	S1	State Threatened	Highest	caves (including limestone sinks), mines, abandoned buildings, and large hollow trees; prefers to feed and roost over water
Neotoma floridana	Eastern Woodrat	G5	S3/S4	Of concern, State	Moderate	wide variety of habitats
Perimyotis subflavus	Tri-colored Bat	G5	SNR		Highest	abandoned mines and caves, bridges, buildings
Sciurus niger niger	Southern Fox Squirrel	G5	S4	Of concern, State	Moderate	cavity trees
Ursus americanus	Black Bear	G5	S3?	Of concern, State	Moderate	early successional habitat and forest interior; den sites

Table 2. Terrestrial priority species and their ecosystems: reptiles & amphibians.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Acris crepitans	Northern Cricket Frog	G5	S5	Of Concern, State	Moderate	isolated, temporary wetlands with no fish; open grassy marshes or shallow water bodies
Ambystoma cingulatum	Flatwoods Salamander (Frosted)	G2/G3	S1	Federal Threatened; State Endangered	Highest	isolated, temporary wetlands with no fish that have open canopy above and abundant grasses and sedges
Ambystoma tigrinum	Tiger Salamander	G5	S2/S3	Of Concern, State	Highest	isolated, temporary wetlands with no fish that have open canopy above and abundant grasses and sedges
Apalone ferox	Florida Softshell Turtle	G5	SNR	State Threatened	High	wetlands like rivers, ponds, and lakes with sandy banks and bars; soft substrate for burrowing
Apalone spinifera	Spiny Softshell Turtle	G5	SNR	State Threatened	Moderate	restricted to reservoirs and associated rivers with sandbars and sandy/soft substrates
Chelydra serpentina	Snapping Turtle (Common)	G5	SNR	State Threatened	Moderate	soft -bottomed wetlands like rivers, ponds, and lakes that have abundant aquatic vegetation
Clemmys guttata	Spotted Turtle	G5	S5	State Threatened	High	small ponds, streams, swamps, flooded bottomland hardwood forests, and other shallow water bodies with soft substrate for burrowing; aquatic vegetation
Crotalus horridus	Timber Rattlesnake	G4	SNR	Of Concern, State	High	dry, south-facing slopes at high elevations; rock outcrops or logs for den sites with south face exposed to sun

Table 2. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Deirochelys recticularia	Chicken Turtle	G5	SNR	State Threatened	Moderate	freshwater and wetland systems with still water; surrounding upland habitat of live oak/pine
Eurycea chamberlainii	Chamberlain's Dwarf Salamander	G4	SNR		Highest	wetland types like seepages near small streams; leaf litter and small debris
Hyla avivoca	Bird-voiced Treefrog	G5	S5	Of Concern, State	Moderate	large river bottom swamps
Kinosternon baurii	Striped Mud Turtle	G5	S?	Of Concern, State	Moderate	in and around the floodplain swamps of rivers; shallow water; soft substrates
Nerodia floridana	Florida Green Watersnake	G5	S2	Of Concern, State	Highest	quiet open water such as Carolina bays, lakes, old rice fields, and reservoirs with "pad plants"
Ophisaurus attenuatus	Slender Glass Lizard	G5	S4		Moderate	underground refugia such as stump holes and rodent burrows; open canopied forests or fields
Pituophis melanoleucus	Pine Snake (Northern)	G4	S2/S3	Of Concern, State	Highest	pine sites with dry soils; underground refugia such as stump holes and rodent burrows
Pituophis melanoleucus mugitus	Pine Snake (Florida)	G4	S2	Of Concern, State	Highest	pine sites with well-drained soils; underground refugia such as stump holes and rodent burrows
Pseudacris feriarum	Upland Chorus Frog	G5	S3/S4	Of Concern, State	Moderate	isolated, temporary wetlands with no fish
Pseudemys concinna	River Cooter	G5	SNR	State Threatened	Moderate	Restricted to reservoirs and associated rivers with aquatic vegetation

Table 2. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Pseudemys floridana	Florida Cooter	G5	SNR	State Threatened	Moderate	slow-moving rivers and non-flowing wetlands like ponds and small lakes with soft bottoms, basking sites, and aquatic vegetation
Pseudobranchus striatus striatus	Broad-striped Dwarf Siren	G5	S2	State Threatened	Highest	isolated, shallow, acidic, temporary wetlands with no fish that have open canopy above and abundant grasses and sedges; small streams with no flow and muck bottoms sometimes
Pseudotriton montanus flavissimus	Mud Salamander (Gulf Coast)	G5	S3/S4	Of Concern, State	High	fossorial; wetland areas such as cypress-tupelo ponds, floodplain forests, and seepage slopes
Rana capito capito	Gopher Frog (Carolina)	G3/G4	S1	Federal Threatened; State Endangered	Highest	isolated, temporary to semi-permanent wetlands with no fish that have open canopy above and abundant grasses and sedges
Rana palustris	Pickerel Frog	G5	SNR	Of Concern, State	High	standing water in late winter; moist habitat usually within hardwood forests; sphagnum bogs, meadows, and grassy fields near shaded streams
Rhadinea flavilata	Pine Woods Snake	G4	SNR	Of Concern, State	High	moist pine flatwoods with many rotten logs; underground refugia such as stump holes and rodent burrows
Seminatrix pygaea	Black Swamp Snake	G5	S?	Of Concern, State	High	wetlands with abundant aquatic vegetation; leaf litter; *Sphagnum* moss
Terrapene carolina	Eastern Box Turtle	G5	SNR		Moderate	moist woodlands; sandy or loamy soils in open for egg laying; loose soils and leaf litter for burrowing

Table 2. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Trachemys scripta	Yellow-bellied Slider	G5	SNR	State Threatened	High	non-flowing wetlands like ponds and small lakes with soft bottoms and abundant vegetation

Table 3. Terrestrial priority species and their ecosystems: birds.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Actitis macularia	Spotted Sandpiper	G5	SNA		Moderate	tidal to freshwater systems; primarily coastal but occurs inland
Aix sponsa	Wood Duck	G5	SNRB,SNRN,SNRM		High	nest cavities near fresh water; emergent vegetation; ponds, lakes, rivers, swamps, BEAVER PONDS
Ammodramus henslowii	Henslow's Sparrow	G4	SZN	Of Concern, State	Highest	moist, grassy areas in open pinewoods
Ammodramus savannarum	Grasshopper Sparrow	G5	SNRB,SNRN		Highest	broomsedge fields and other openings
Anas acuta	Northern Pintail	G5	SNRN		Highest	shallow open water with accessible plants and invertebrates
Anas discors	Blue-winged Teal	G5	SNRB,SNRN		Moderate	shallow open water with accessible plants and invertebrates
Anas fulvigula	Mottled Duck	G4	S?		Moderate	shallow open water with accessible plants and invertebrates
Anas platyrhynchos	Mallard	G5	SNRB,SNRN		Highest	freshwater boides for foraging; shallow water with accessible plants and invertebrates
Anas rubripes	American Black Duck	G5	SNRN		Highest	shallow open water with accessible plants and invertebrates
Anhinga anhinga	Anhinga	G5	SNRB,SNRN		Moderate	fresh or brackish water for foraging; trees over or surrounded by water for nesting
Ardea alba	Great Egret	G5	SNRB,SNRN		High	shallow water bodies or shorelines for foraging; trees over or surrounded by water for nesting

Table 3. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Ardea herodias	Great Blue Heron	G5	SNRB,SNRN		Moderate	shallow water bodies or shorelines for foraging; trees over or surrounded by water for nesting
Aythya collaris	Ring-necked Duck	G5	SNRN		Moderate	submerged aquatic vegetation and invertebrates such as mollusks
Botaurus lentiginosus	American Bittern	G4	SNRN	Of Concern, State	Highest	extensive freshwater marshes with grasses>3ft. Tall
Buteo lineatus	Red-shouldered Hawk	G5	SNR		Moderate	wet or moist hardwood forests for nesting and foraging
Buteo platypterus	Broad-winged Hawk	G5	S4		Moderate	upland hardwood or mixed forests; forage within woodlands; nests in tree crotches in canopy
Butorides virescens	Green Heron	G5	SNRB,SNRN		Highest	shallow water bodies and shorelines for foraging; dense shrubs and thickets near water for nesting
Calidris fuscicollis	White-rumped Sandpiper	G5	SNA		Moderate	most frequent in managed impoundments
Calidris himantopus	Stilt Sandpiper	G5	SNA		High	most frequent in fresh to brackish ponds/impoundments
Calidris melanotos	Pectoral Sandpiper	G5	SNA		Moderate	more common away from coast
Calidris minutilla	Least Sandpiper	G5	SNRN		High	forages in clumps of marine vegetation; common on coast
Caprimulgus carolinensis	Chuck-will's-widow	G5	S4		High	openings for nocturnal feeding; mixed forests with light to moderate understory

Table 3. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Ceryle alcyon	Belted Kingfisher	G5	SNR		High	sandy vertical banks for nesting burrows; perches near water for foraging
Cistothorus platensis	Sedge Wren	G5	SUB		Highest	favor brackish marshes
Coccyzus americanus	Yellow-billed Cuckoo	G5	S4		High	closed canopy deciduous forests with thick tangles
Contopus virens	Eastern Wood-Pewee	G5	S5		High	open forests with sparse midstory
Dendroica discolor	Prairie Warbler	G5	S4		High	open old fields with scattered saplings; open woodlands with shrub-scrub
Dryocopus pileatus	Pileated Woodpecker	G5	SNR		Moderate	extensive mature forests with dead snags for nest cavities; probably prefer riverbottom hardwoods
Egretta caerulea	Little Blue Heron	G5	SNRB,SNRN	Of Concern, State	Highest	shorelines, shallow water, or mudflats for foraging; shrubs or trees over or surrounded by water for colonial nesting
Egretta thula	Snowy Egret	G5	SNRB,SNRN		Moderate	shorelines, shallow water, or mudflats for foraging; shrubs or trees over or surrounded by water for colonial nesting
Egretta tricolor	Tricolored Heron	G5	SNRB,SNRN		High	shorelines, shallow water, or mudflats for foraging; shrubs or trees over or surrounded by water for colonial nesting
Elanoides forficatus	Swallow-tailed Kite	G5	S2	State Endangered	Highest	open savannahs for foraging; mature trees for nesting near swamps and marshes
Empidonax virescens	Acadian Flycatcher	G5	S4B		High	Riverbanks, streams, banks, alder zones

Table 3. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Eudocimus albus	White Ibis	G5	SNR		Highest	shallow water or mudflats for foraging on crustaceans; wet meadows or mudflats for probing; thickets or trees over or surrounded by fresh water for colonial nesting
Euphagus carolinus	Rusty Blackbird	G4	SNRN		Highest	swamps and margins; wet thickets near hardwoods
Fulica americana	American Coot	G5	SHB,SNRN		Moderate	open shallow fresh water such as lakes, ponds, and bays for foraging
Gallinago gallinagodelicata	Wilson's Snipe	G5	SNRN		High	boggy areas; wet meadows with short grass; along pond and marsh margins for probe foraging
Gallinula galeata	Common Gallinule	G5	SNR		Moderate	open freshwater with marsh vegetation for foraging and nesting
Haliaeetus leucocephalus	Bald Eagle	G5	S2	State Endangered	High	tall living trees, especially pines for nesting; perches near large open water where foraging occurs
Hylocichla mustelina	Wood Thrush	G5	S3?		High	moist understory of shrubs or saplings in deciduous woodlands; leaf litter
Icteria virens	Yellow-breasted Chat	G5	S4B		High	old fields, briar thickets, dry woodland margins;
Icterus galbula	Baltimore Oriole	G5	SNRB,SNRN		High	open, scattered hardwoods
Icterus spurius	Orchard Oriole	G5	S5?B		Moderate	orchard-like sttings; woodland margins

Table 3. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Ixobrychus exilis	**Least Bittern**	**G5**	**SNRB,SNRN**		**Highest**	**shallow water bodies for foraging; marsh vegetation**
Limnodromus scolopaceus	Long-billed Dowitcher	G5	SNRN		Moderate	most common in fresh coastal wetlands
Limnothlypis swainsonii	Swainson's Warbler	G4T4	S4		High	in mountains: deciduous or mixed forest ravines with thick understory of rhododendron or mountain laurel; at coast: cane stands in hardwoods
Melanerpes carolinus	Red-bellied Woodpecker	G5	SNR		Moderate	open, mature woods with dead snags for nest cavities; man-made poles with cavities
Melanerpes erythrocephalus	Red-headed Woodpecker	G5	SNR		Moderate	open, mature woods with dead snags for nest cavities; man-made poles with cavities
Mniotilta varia	Black-and-white Warbler	G5	SNRB,SNRN		High	mature hardwood forests; coves
Mycteria americana	Wood Stork	G4	S1S2	Federally Threatened and State Endangerd	Highest	shallow water with concentrated prey (6-10 in. deep) for foraging; trees over or surrounded by water for colonial nesting, particularly cypress swamps and trees on small islands
Nyctanassa violacea	Yellow-crowned Night Heron	G5	SNRB,SNRN		Highest	shorelines of water bodies for foraging, especially for crustaceans; trees or thickets near water for colonial nesting, will nest in trees that are on dry lands
Nycticorax nycticorax	Black-crowned Night Heron	G5	SNRB,SNRN		Highest	shorelines of water bodies for foraging; shrubs or trees over or surrounded by water for colonial nesting

Table 3. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Oporornis formosus	Kentucky Warbler	G5	S4		High	moist hardwood forests with rich understory
Parula americana	Northern Parula	G5	SNRB		Moderate	mature, moist forests; hemlock forests in mountains and swamps or bottomlands with Spanish moss near coast
Passerina caerulea	Blue Grosbeak	G5	SNRB		Moderate	hardwood saplings or shrubs for nesting; open areas
Passerina ciris	Painted Bunting	G5	SNRB		Highest	woodland margins; dense thickets in openings
Passerina cyanea	Indigo Bunting	G5	SNRB		Moderate	woodland margins; shrubby thickets in openings
Picoides pubescens	Downy Woodpecker	G5	SNR		Moderate	middle-aged to mature woodlands; prefer hardwoods; dead snags for nest cavities
Pipilo erythrophthalmus	Eastern Towhee	G5	SNR		High	brushy areas; woodland margins and understory
Piranga rubra	Summer Tanager	G5	S?		Moderate	dry, mixed woodlands
Platalea ajaja	Roseate Spoonbill	G5	SNR		Moderate	shallow water for tactile feeding; shrubs or trees over or surrounded by water for colonial nesting, particularly thickets of small trees on coastal islands
Plegadis falcinellus	Glossy Ibis	G5	SHB,SNRN		Moderate	shallow water, mudflats, or wet meadows for probing and foraging; shrubs or trees over or surrounded by water for colonial nesting, particularly dense thickets on coastal islands
Pluvialis dominica	American Golden Plover	G5	SNA		Highest	rare migrant
Pluvialis squatarola	Black-bellied Plover	G5	SNRN		High	common coastal migrant

Table 3. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Podiceps auritus	Horned Grebe	G5	SNRN,SNRM		Highest	small fish as prey
Podilymbus podiceps	Pied-billed Grebe	G5	SNRB,SNRN		Highest	fresh or slightly brackish water with emergent vegetation within used for nesting; open water in winter for foraging
Poecile carolinensis	Carolina Chickadee	G5	SNR		Moderate	mature woodlands with dead snags for nest cavities; will use bird boxes
Porphyrio martinica	Purple Gallinule	G5	S4	Of Concern, State	Highest	freshwater marshes with emergent and floating vegetation for foraging and nesting
Porzana carolina	Sora	G5	SNRN		High	freshwater marshes for foraging and nesting
Progne subis	Purple Martin	G5	SNRB		High	forage over open areas near or over water; nest in man-made houses or gourds
Protonotaria citrea	Prothonotary Warbler	G5	S3B		Moderate	near standing water; open swamps with cavities for nesting; willow thickets near lakes and ponds; old stumps and other rotting logs
Rallus elegans	King Rail	G4	SNR		Highest	mudflats and shallow fresh or brackish water for foraging
Recurvirostra americana	American Avocet	G5	SNRN		High	most frequent in managed impoundments
Regulus satrapa	Golden-crowned Kinglet	G5	S4		Moderate	winter in coniferous or mixed woodlands
Scolopax minor	American Woodcock	G5	S4		Moderate	moist soils and leaf litter for probe foraging; woodlands for nesting; openings for mating displays

Table 3. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Seiurus motacilla	Louisiana Waterthrush	G5	S4		High	deciduous or mixed forests with rocky streams
Setophaga dominica	Yellow-throated Warbler	G5	S3?		Moderate	moderately open, mature, moist forests; pines, mixed forests; Spanish moss
Setophaga virens waynei	Black-throated Green Warbler (Wayne's)	G5TU	SNR		Highest	coastal moist forests like swamps and bottomlands with cypress and white cedar
Thryothorus ludovicianus	Carolina Wren	G5	SNR		Moderate	woodland thickets; leaf litter; cavities or ledges for nesting; will use bird boxes and many other human material
Toxostoma rufum	Brown Thrasher	G5	SNR		High	moderate to dense brush and saplings
Tryngites subruficollis	Buff-breasted Sandpiper	G4	SNA		Highest	may be seen in pastures and golf courses; rare migrant; most common in interior
Vireo flavifrons	Yellow-throated Vireo	G5	S3?B		Moderate	open, moist, mature, deciduous woodlands with tall trees; near water
Vireo griseus	White-eyed Vireo	G5	S4?B		Moderate	dense, moist thickets
Wilsonia citrina	Hooded Warbler	G5	S4?B		Moderate	mature, moist deciduous forests; some mixed forests; rich understory layer

Table 4. Terrestrial Priority Species and Their Ecosystems: Insects.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Acanthametropus pecatonica	"A Mayfly"					mesic forests near water
Dolania americana	American Sand Burrowing Mayfly	G4	S3			mesic forests near water
Euphyes bimacula	Two-Spotted Skipper					isolated wetlands: open bogs, fens, and marshes with *Carex* sp.; nectar plants like iris
Homoeoneuria dolani	"A Mayfly"					mesic forests near water
Rhadinoceraea zigadenusae	Zigadenus Sawfly					dependent upon host plant: Death Camas (*Zigadenus densus*)
Siphlonurus decorus	"A Mayfly"					mesic forests near water
Somatochlora calverti	Calvert's Emerald	G3	SNR			boggy forest seepages for breeding; forest openings for foraging
Taeniopteryx robinae	Savannah Willowfly	G1	SNR			mesic forests near water
Toxorhynchites rutilus rutilus	"An Elephant (Tree Hole Mosquito)"					tree holes and artificial basins for breeding; nectar producing plants for foraging
Toxorhynchites rutilus septentionalis	"An Elephant (Tree Hole Mosquito)"					tree holes and artificial basins for breeding; nectar producing plants for foraging
Tsalia berneri	"A Mayfly"					mesic forests near water

Table 5. Aquatic priority species and their ecosystems: freshwater & diadromous fishes.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Alosa aestivalis	Blueback Herring	G3	S3	Of Concern, State	Highest	
Alosa mediocris	Hickory Shad	G5	S4	Of Concern, State	Highest	
Alosa sapidissima	American Shad	G5	S5	Of Concern, State	Highest	
Ameiurus brunneus	Snail Bullhead					Rocky riffles, runs, shoals, and pools in streams and rivers
Anguilla rostrata	American Eel	G5	SNR	Of Concern, State	Highest	
Ameiurus catus	White Catfish					Warm ponds, reservoirs, and medium to large rivers in freshwater and brackish habitats
Ameriurus platycephalus	Flat Bullhead					Streams, rivers, and impoundments; slow-flowing water along banks and in pools; mud, sand, or rock substrates
Carpiodes cyprinus	Quillback					Warm, calm rivers with low to moderate-gradient reaches; spawn in riffles; variable substrate
Carpiodes velifer	Highfin Carpsucker					Rivers with moderate to swift current; sand or gravel substrate
Chologaster cornuta	Swampfish					Calm, acidic blackwater streams; organic matter and aquatic vegetation and woody debris
Clinostomus funduloides	Rosyside Dace					Clear flowing pools of headwater streams and occasionally larger streams

Table 5. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Cyprinella chloristia	Greenfin Shiner					Cool, clear creeks or small to moderately-sized rivers; slower areas and margins of pools and runs; clean sand and rocky substrates; logs and rocks for crevice spawning
Cyprinella pyrrhomelas	Fieryblack Shiner					Cool, clear creeks and small to moderately-sized rivers; rocky runs and pools below riffles; coarse substrate; logs and rocks for crevice spawning
Elassoma boehlkei	Carolina Pygmy Sunfish					Shallow, slow-moving, acidic water of ponds, ditches, and streams; abundant aquatic vegetation
Elassoma evergladei	Everglades Pygmy Sunfish					Swamps and backwaters; dense vegetation
Enneacanthus chaetodon	Blackbanded Sunfish					Shallow and densely vegetated margins of lakes, ponds, swamps, roadside ditches, streams; sand or mud substrate; stained, acidic water of 4-5pH; beaver ponds for spawning
Ennaecanthus obesus	Banded Sunfish					Sluggish streams and vegetated backwaters of lakes and ponds, often over silt or sand; very low current velocities
Etheostoma serrifer	Sawcheek Darter					Mud, sand, or organic substrate; aquatic vegetation; moderate current velocity

Table 5. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Etheostoma thalassinum	Seagreen Darter					Large creeks and rivers with moderate to swift currents; wide variations in water temperature and clarity; rock, rubble, or gravel substrate in riffles
Hybopsis hypsinotus	Highback Chub					Cool to warm water creeks and small rivers; clear to turbid water; riffles and runs; with sand, gravel and rock substrates
Morone saxatilis	Striped Bass					Medium to large rivers; clean, sandy substrate with fine gravel and rock; shallow rocky and gravely areas with strong current for spawning sites; 17-18 C optimal for egg development
Moxostoma collapsum	Notchlip Redhorse					Medium to large rivers of moderate gradient; pool-dweller in streams; also in natural and artificial lakes
Moxostoma robustum	Robust Redhorse					Riffles, runs, and pools of mainstream rivers; tree snags; deep water near shore; course gravel substrate for spawning; cooler waters preferred during summer; lenthic habitat during part of life cycle
Notropis altipinnis	Highfin Shiner					Pools and runs of moderate streams; sand to boulder/bedrock substrates
Notropis bifrenatus	Bridle Shiner					Warm water streams, swamps, lakes; clear or slightly stained water; abundant aquatic vegetation for feeding and breeding; sand, mud, or gravel substrates

Table 5. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Notropis chalybaeus	Ironcolor Shiner					Low-velocity blackwater streams and swamps; woody debris
Notropis procne	Swallowtail Shiner					Sandy pools of small to medium streams
Notropis scepticus	Sandbar Shiner					Flowing pools over a sand substrate in moderate to large streams
Percina crassa	Piedmont Darter					Clean, moderate to large stream riffles; sand to cobble substrate; moderate currents
Pteronotropis stonei	Lowland Shiner					Small to medium-clear and blackwater streams; moderate flow-like slow riffles, runs, and flowing pools; clean sand substrate; aquatic vegetation
Semotilus lumbee	Sandhills Chub					Small headwater streams and moderate-sized streams; clean gravel or sand substrates

Table 6. Aquatic priority species and their ecosystems: mussels.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Anodonta implicata	Alewife Floater	G5	S1 recom.		High	Streams, rivers, pools; silt, sand, gravel substrates; requires host fish, alewife (*Alosa pseudoharengus)*and possibly other clupeids
Elliptio angustata	Carolina Lance	G4	S3		Moderate	Sand and sandy gravel substrates; often at edge of aquatic vegetation
Elliptio complanata complex	Eastern Elliptio	G5	S5		Moderate	Large rivers, canals, reservoirs, and headwater streams; variety of fish hosts; no specific flow volume or substrate requirements
Elliptio congaraea	Carolina Elephantear	G3	S3	Of Concern, State	Moderate	Rivers and small streams with sandy substrates
Elliptio fisheriana/nasutilus	Northern Lance	G4	SNR		High	Soft sediments in shallow water near stream and river banks; stable banks with intact riparian zone
Elliptio icterina complex	Variable Spike	G5Q	S4		Moderate	Slow-flowing streams and swamps to faster flowing streams and rivers; clear or tannic water; sand, gravel, bedrock, mud, and detritus substrates
Elliptio roanokensis	Roanoke Slabshell	G3	S2		High	Large rivers or small creeks; variable flow rates and temperatures; host fish unknown
Lampsilis cariosa	Yellow Lampmussel	G3/G4	S2		Highest	Gravel bars, margins of the flowing portions of water bodies, and cracks in bedrock of large rivers and small streams
Lampsilis radiata	Eastern Lampmussel	G5	S2	Of Concern, State	High	Streams, rivers, and blackwater swamps; mud or sand substrates

Table 6. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Lampsilis splendida/radiata	Rayed Pink Fatmucket	G3	S2	Of Concern, State	High	Streams, rivers, and blackwater swamps; mud or sand substrates; Laregmouth Bass host fish
Leptodea ochracea	Tidewater Mucket	G3/G4	S2		High	Pristine freshwater rivers with tidal influence
Ligumia nasuta	Eastern Pondmussel	G4	S2		High	Lakes, ponds, streams, and rivers; muddy, sandy, or gravely substrates; very shallow water near river banks
Toxolasma pullus	Savannah Lilliput	G2	S1	Of Concern, State	Highest	Shallow water and the edges of streams, rivers, and lakes but also backwaters; mud or silty sand substrates; host fish sunfish *(Lepomis)* species

Table 7. Aquatic priority species and their ecosystems: crayfish.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Cambarus reflexus	Pine Savannah Crayfish	G4	S3		Highest	Terrestrial, obilgate burrower; burrows and under logs in low-lying seepages and bogs with black soil; also in mixed hardwood and swamp forests
Procambarus blandingii	Santee Crayfish	G4	S4		Moderate	Lenthic and slow-moving sections of lotic streams; vegetation or woody debris when found in swamps
Procambarus chacei	Cedar Creek Crayfish	G4	S4		Moderate	lenthic and lotic habitats; swamps, ponds, lakes, roadside ditches, springs, and streams; primary burrower
Procambarus enoplosternum	Black Mottled Crayfish	G4/G5	SNR		Moderate	Slow to moderately flowing streams and impoundments; can be in shaded streams with dense beds of macrophytes or in shallow lenthic habitats like roadside ditches
Procambarus hirsutus	Shaggy Crayfish	G4	S4		Moderate	Clear streams with good flow
Procambarus lepidodactylus	Pee Dee Lotic Crayfish	G4	S4		Moderate	Clear creeks of moderate gradient flowing through swampy areas often among tree roots; sandy substrate

Table 8. Aquatic priority species and their ecosystems: reptiles & amphibians.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Acris crepitans	Northern Cricket Frog	G5	S5	Of Concern, State	Moderate	isolated, temporary wetlands with no fish
Alligator mississippiensis	American Alligator	G5	S5	Federal Threatened	Moderate	large river swamps, lakes, ponds, coastal impoundments, abandoned rice fields, brackish water marshes, and estuarine tidal creeks; juveniles will use Carolina bays and other seasonal wetlands
Ambystoma tigrinum	Tiger Salamander	G5	S2/S3	Of Concern, State	Highest	isolated, temporary wetlands with no fish that have open canopy above and abundant grasses and sedges
Apalone spinifera	Spiny Softshell Turtle	G5	SNR	State Threatened	Moderate	restricted to reservoirs and associated rivers with sandbars and sandy substrates
Chelydra serpentina	Snapping Turtle (Common)	G5	SNR	State Threatened	Moderate	wetlands like rivers, ponds, and lakes
Deirochelys recticularia	Chicken Turtle	G5	SNR	State Threatened	Moderate	and surrounding upland habitat of live oak/pine
Eurycea chamberlainii	Chamberlain's Dwarf Salamander	G4	SNR		Highest	wetland types like seepages near small streams; leaf litter and small debris
Hemidactylium scutatum	Four-toed Salamander	G5	SNR	Of Concern, State	High	edges of wetlands and seepage slopes with abundant *Sphagnum*
Hyla andersonii	Pine Barrens Treefrog	G4	S2/S3	State Threatened	Highest	open herb shrub bogs, pocosins, and related types; down-slope seepage zones
Kinosternon baurii	Striped Mud Turtle	G5	S?	Of Concern, State	Moderate	in and around the floodplain swamps of rivers

Table 8. Continued.

SCIENTIFIC NAME	COMMON NAME	G-RANK	S-RANK	LEGAL STATUS	PRIORITY	SPECIFIC HABITAT REQUIREMENTS
Nerodia floridana	Florida Green Watersnake	G5	S2	Of Concern, State	Highest	open water Carolina bays, lakes, old rice fields, and reservoirs with "pad plants"
Pseudacris feriarum	Upland Chorus Frog	G5	S3/S4	Of Concern, State	Moderate	isolated, temporary wetlands with no fish
Pseudemys concinna	River Cooter	G5	SNR	State Threatened	Moderate	Restricted to reservoirs and associated rivers
Pseudemys floridana	Florida Cooter	G5	SNR	State Threatened	Moderate	Slow-flowing rivers and non-flowing wetlands like ponds and small lakes with soft bottoms, basking sites, and aquatic vegetation
Rana capito capito	Gopher Frog (Carolina)	G3/G4	S1	Federal Threatened; State Endangered	Highest	isolated, temporary wetlands with no fish that have open canopy above and abundant grasses and sedges
Seminatrix pygaea	Black Swamp Snake	G5	S?	Of Concern, State	High	wetlands with abundant aquatic vegetation
Trachemys scripta	Yellow-bellied Slider	G5	SNR	State Threatened	High	non-flowing wetlands like ponds and small lakes

Appendix 3. SCDNR Freshwater Fisheries Wateree River Data

Table 1. An assessment of the Wateree River Fish Community in the vicinity of Union Camp, Eastover, South Carolina; 1984-1987; mean catch by species per 1000 seconds of electrofishing effort (C/1000).

Species	Congaree River	Upper Wateree Rivers	Wateree River above the Union Camp effluent diffuser	Water River below the Union Camp effluent diffuser	Overall Seasons Combined
American Shad	0.1		0.1	0.2	0.1
Bowfin	0.8	0.2	0.1	0.4	0.4
Black Crappie	0.3	0.2	0.2	1.0	0.4
Blue Catfish	0.9		2.3	1.2	1.1
Bluegill	31.6	14.0	13.1	12.0	17.8
Channel Catfish	0.3	0.2	1.1	0.7	0.6
Coastal Shiner	1.7	4.4	8.4	14.6	7.4
Common Carp	1.3	1.8	0.6	0.7	1.1
Dollar Sunfish		0.1	1.9	2.9	1.2
Eastern Silvery Minnow	18.2	8.8	21.6	66.0	28.5
Flathead Catfish		0.1	0.1	0.1	0.1
Flier	0.1				
Gizzard Shad	15.8	10.1	15.1	8.8	12.3
Green Sunfish		0.2			0.1
Golden Shiner			0.1	1.0	0.3
Hickory Shad	0.3		0.1	0.1	
Hybrid Sunfish				0.1	
Inland Silverside	0.4	5.4	0.5	1.4	2.1
Largemouth Bass	5.6	7.4	6.6	8.2	7.1

Species	Congaree River	Upper Wateree Rivers	Wateree River above the Union Camp effluent diffuser	Water River below the Union Camp effluent diffuser	Overall Seasons Combined
Longnose Gar	2.1	2.3	7.0	6.8	4.5
Mosquitofish			0.4		0.1
Pirate Perch		0.2			0.1
Pumpkinseed		0.2	0.1	0.5	0.2
Redbreast Sunfish	3.7	2.7	1.9	0.8	2.3
Redear Sunfish	2.3	11.0	2.3	5.2	5.5
Spottail Shiner		0.1		0.1	0.1
Spotted Sunfish	1.1	0.1	2.0	1.9	1.2
Spotted Sucker	0.8	1.3	0.2	0.1	0.6
Striped Bass	0.1		0.7	0.6	0.4
Threadfin Shad	5.6	21.1	55.5	61.1	36.0
Tessellated Darter	0.3	0.1	0.1	0.5	0.2
Warmouth	0.1	0.1	0.1	0.1	0.1
White Bass	1.5	0.1	0.5	0.8	0.7
White Perch	2.7		1.7	5.7	2.5
Whitefin Shiner	15.7	17.5	10.6	26.8	17.8
Yellow Perch	2.0	0.2	0.1	1.4	0.9
Overall Mean	115.4	110.0	155.4	232.0	153.1
Effort (s)	7,520	9,302	8,087	8,399	33,308
Number of Species	27	27	30	33	37
Number of Individuals	868	1,023	1,257	1,949	5,097

Appendix 4: SCDNR Freshwater Fisheries Congaree Swamp National Monument Data

Table 1. Fishery survey of Congaree Swamp National Monument (present day Park) progress report; July 1, 1996 – June 30, 1997; species collected in August 1996 with equal effort from Wise and Weston lakes, Congaree Swamp National Monument, South Carolina.

Family	Common Name	Scientific Name	Wise Lake	Weston Lake
Lepisosteidae	Longnose gar	*Lepisosteus osseus*	1	1
Amiidae	Bowfin	*Amia calva*	5	6
Cyprinidae	Common carp	*Cyprinus carpio*	4	1
	Golden shiner	*Notemigonus crysoleucas*	1	20
	Ironcolor shiner	*Notropsis chalybaeus*	79	19
	Taillight shiner	*Notropsis maculatus*	5	-
Catostomidae	Creek chubsucker	*Erimyzon oblongus*	1	-
	Lake chubsucker	*Erimyzon sucetta*	1	-
	Spotted sucker	*Minytrema melanops*	1	-
Esocidae	Chain pickerel	*Esox niger*	1	-
Aphredoderidae	Pirate perch	*Aphredoderus sayanus*	1	4
Poecillidae	Eastern mosquitofish	*Gambusia holbrooki*	6	7
Atherinidae	Brook silversides	*Labidethes sicculus*	1	1
Centrarchidae	Flier	*Centrarchus macropterus*	2	-
	Bluespotted sunfish	*Enneacanthus gloriosus*	1	-
	Redbreast sunfish	*Lepomis auritus*	5	-
	Warmouth	*Lepomis gulosus*	9	6
	Bluegill	*Lepomis macrochirus*	134	46
	Dollar sunfish	*Lepomis marginatus*	20	8
	Redear sunfish	*Lepomis microlophus*	9	1
	Largemouth bass	*Micropterus salmoides*	12	18

Family	Common Name	Scientific Name	Wise Lake	Weston Lake
Centrarchidae	Black crappie	*Pomoxis nigromaculatus*	16	1
Percidae	Swamp darter	*Etheostoma fusiforme*	1	-
		Totals	**247**	**144**

Table 2. Fishery survey of Congaree Swamp National Monument (present day Park) progress report; July 1, 1996 – June 30, 1997; **s**pecies collected by boat and backpack electrofishing on October 22 and 29, 1996 from Cedar Creek, Congaree Swamp National Monument, South Carolina.

Family	Common Name	Scientific Name	Wise Lake Bridge	Red Bluff Road	South Cedar Creek Road
Amiidae	Bowfin	*Amia calva*	1	0	1
Clupeidae	Gizzard shad	*Dorosoma cepedianum*	1	0	0
Cyprinidae	Coastal shiner	*Notropsis petersoni*	14	0	0
Catostomidae	Creek chubsucker	*Erimyzon oblongus*	1	0	0
	Spotted sucker	*Minytrema melanops*	2	2	1
Ictaluridae	Tadpole madtom	*Noturus gyrinus*	1	0	0
	Margined madtom	*Noturus insignis*	6	0	1
Esocidae	Redfin pickerel	*Esox americanus*	0	2	0
	Chain pickerel	*Esox niger*	1	0	0
Aphredoderidae	Pirate perch	*Aphredoderus sayanus*	1	7	0
Poecillidae	Eastern mosquitofish	*Gambusia holbrooki*	2	0	0
Atherinidae	Brook silversides	*Labidethes sicculus*	45	0	0
Centrarchidae	Flier	*Centrarchus macropterus*	1	0	0
	Redbreast sunfish	*Lepomis auritus*	52	23	13
	Warmouth	*Lepomis gulosus*	16	17	3
	Bluegill	*Lepomis macrochirus*	54	1	0
	Dollar sunfish	*Lepomis marginatus*	18	18	1
	Redear sunfish	*Lepomis microlophus*	16	0	0
	Spotted sunfish	*Leopmis punctatus*	10	13	0
	Largemouth bass	*Micropterus salmoides*	7	1	1
Percidae	Yellow perch	*Perca flavescens*	5	1	2

Family	Common Name	Scientific Name	Wise Lake Bridge	Red Bluff Road	South Cedar Creek Road
		Totals	254	85	23

Table 3: Species diversity and condition of the fish community during a drought in Congaree National Park, October 2005; a complete list of all species and the total number of each species collected during the SCDNR fish survey of the Congaree National Park and surrounding areas, 1999 through 2002.

Family	Common Name	Scientific Name	National Park Sites		All Sites (including off-site samples)
			Streams	*Lakes*	
Lepisosteidae	Longnose gar	*Lepisosteus osseus*	12	P	16
Amiidae	Bowfin	*Amia calva*	1	P	7
Anguillidae	American eel	*Anguilla rostrata*	1		2
Clupeidae	Gizzard shad	*Dorosoma cepedianum*	5		5
	Threadfin shad	*Dorosoma petenense*	4		4
Umbridae	Eastern mudminnow	*Umbra pygmaea*	195	P	207
Esocidae	Redfin pickerel	*Esox americanus*	539	P	568
	Chain pickerel	*Esox niger*	24	P	27
Cyprinidae	Greenfin shiner	*Cyprinella chloristius*	1	P	1
	Whitefin shiner	*Cyprinella nivea*	60		80
	Common carp	*Cyprinus carpio*		P	1
	Eastern silvery minnow	*Hybognathus regius*	362		362
	Bluehead chub	*Nocomis leptocephalus*	4		7
	Golden shiner	*Notemigonus crysoleucas*	87		100
	Dusky shiner	*Notropsis cummingsae*	365		609
	Spottail shiner	*Notropsis hudsonius*	19		19
	Yellowfin shiner*	*Notropsis lutipinnis*			1
	Taillight shiner	*Notropsis maculatus*	11	P	27
	Coastal shiner	*Notropsis petersoni*	39		48
	Sailfin shiner	*Pteronotropsis hypselopterus*	161		563

Family	Common Name	Scientific Name	National Park Sites		All Sites (including off-site samples)
			Streams	*Lakes*	
Catostomidae	Creek chubsucker	*Erimyzon oblongus*	266	P	316
	Spotted sucker	*Minytrema melanops*	7	P	28
	Shorthead redhorse	*Moxostoma macrolepidotum*	7		7
Ictaluridae	Snail bullhead	*Ameiurus brunneus*	4		4
	Yellow bullhead	*Ameiurus natalis*	70		95
	Brown bullhead	*Ameiurus nebulosus*	5		5
	Flat bullhead	*Ameiurus platycephalus*	9		9
	Channel catfish	*Ictalurus punctatus*	7		7
	Tadpole madtom	*Noturus gyrinus*	116		119
	Margined madtom	*Noturus insignis*	156		184
	Flathead catfish	*Pylodictus olivaris*	1		1
Amblyopsidae	Swampfish	*Chologaster cornuta*	3		5
Aphredoderidae	Pirate perch	*Aphredoderus sayanus*	1020	P	1074
Cyprinodontidae	Lined topminnow	*Fundulus lineolatus*	5		6
Poecillidae	Eastern mosquitofish	*Gambusia holbrooki*	1111	P	1150
Atherinidae	Brook silversides	*Labidethes sicculus*	71	P	116
Percichthyidae	White perch	*Morone Americana*	6		6

Family	Common Name	Scientific Name	National Park Sites		All Sites (including off-site samples)
			Streams	*Lakes*	
Centrarchidae	Mud sunfish	*Acantharchus pomotis*	2		5
	Flier	*Centrarchus macropterus*	335	P	356
	Banded pygmy sunfish	*Elassoma zonatum*	84	P	91
	Blackbanded sunfish	*Enneacanthus chaetodon*	1		3
	Bluespotted sunfish	*Enneacanthus gloriosus*	17	P	39
	Banded sunfish*	*Enneacanthus obesus*			1
	Redbreast sunfish	*Lepomis auritus*	792	P	874
	Green sunfish	*Lepomis cyanellus*	1		2
	Pumpkinseed	*Lepomis gibbosus*	23	P	25
	Warmouth	*Lepomis gulosus*	234	P	312
	Bluegill	*Lepomis macrochirus*	624	P	771
	Dollar sunfish	*Lepomis marginatus*	392	P	474
	Redear sunfish	*Lepomis microlophus*	182	P	198
	Spotted sunfish	*Lepomis punctatus*	172	P	217
	Largemouth bass	*Micropterus salmoides*	105	P	142
	Black crappie	*Pomoxis nigromaculatus*	1	P	3
Percidae	Swamp darter	*Etheostoma fusiforme*	1		1
	Tesselated darter	*Etheostoma olmstedi*	222		232
	Sawcheek darter	*Etheostoma serrifer*	84	P	95
	Seagreen darter*	*Etheostoma thalassinum*			11
	Yelllow perch	*Perca flavescens*	100	P	168
	Piedmont darter	*Percina crassa*	7		7
*Fish documented during the project but not within Congaree National Park; P=Present		Total Fish	8133	n/a	9813
		Total Species	55	27	59

Appendix 5: COWASEE Basin Focus Area Partners

Audobon works to conserve and restore natural ecosystems with a strong emphasis on birds and their habitats for the benefit of humanity and earth's biological diversity.

The **Congaree Land Trust** was established in 1992 to promote voluntary conservation of scenic lands, open spaces, farms, forests, natural areas and significant habitats in central South Carolina.

Ducks Unlimited conserves, restores and manages wetlands and associated habitats for North America's waterfowl through working with landowners and partners to acquire land and establish conservation easements and management agreements.

The **Friends of Congaree Swamp** serve as advocates and stewards of Congaree National Park, increasing public awareness through education and protecting and restoring the ecological systems and natural beauty of the park. They also work to maintain compatible land uses outside the park.

The **Natural Resources Conservation Service** provides financial and technical assistance to farmers, ranchers and forest landowners wanting to make conservation improvements to their land. NRCS also provides incentives for these landowners wanting to put wetlands, agricultural land, grasslands and forests under long-term conservation easements.

Private landowners adopting ecological ethics and applying natural management principles within the Focus Area benefits the conservation of the landscape as a whole. Some landowners choose to place their properties in conservation easements to maintain and conserve the natural integrity of their property in perpetuity.

The **Richland County Conservation Commission** is charged with promoting the protection of natural, historical and cultural resources throughout Richland County by negotiating voluntary protection strategies with landowners through such means as conservation easements, land acquisition and grant programs.

The **South Carolina Department of Natural Resources** (SCDNR) serves as the principal advocate for and steward of South Carolina's natural resources. SCDNR serves in this capacity on many fronts including wildlife and fish management, habitat protection through land acquisition, natural resources law enforcement and research.

Sumter County Soil and Water Conservation District is one of many subdivisions of state government under the local direction of a five-member Board of Commissioners. These commissioners volunteer their time and services to help improve natural resources. There are 46 conservation districts in South Carolina which conform to county boundaries. The commissioners direct the efforts of a staff of conservation professionals who provide technical, educational, and professional services to protect the natural

resources of the district. The DNR-Conservation Districts Program provides administration and technical assistance in the implementation of the Soil and Water Conservation Districts Law and the Watershed Conservation Districts Law. Section staff provide direct assistance to the 46 soil and water conservation districts and the 35 watershed conservation districts. Technical duties of staff include planning and application of soil and water conservation practices, promoting habitat protection, monitoring soil erosion, assessing sediment and storm water problems, implementing watershed management and conducting technical clinics and workshops.

The **United States Fish & Wildlife Service** works to develop and apply environmental stewardship based on ecological principles and scientific knowledge of fish and wildlife. Utilizing this information and basic principles, the Service helps guide the conservation, development and management of the Nation's fish and wildlife resources.

Appendix 6: References and Resources

Bogan, A. E and J. Alderman. 2008. Workbook and Key to the Freshwater Bivalves of South Carolina. Revised Second Edition. North Carolina Freshwater Bivalve Conservation Partnership. Raleigh, NC. 74 pp. http://www.dnr.sc.gov/aquaticed/pdf/WorkbookSCclams.pdf Last accessed March 31, 2016.

_____, _____ and J. Price. 2008. Field guide to freshwater mussels of South Carolina. SCDNR. Columbia, SC. 43 pp. http://www.dnr.sc.gov/aquaticed/pdf/MussellFieldGuide.pdf. Last accessed March 31, 2016.

Crane, J. S., J. S. Bulak, D. W. Gates and G. J. Jöbsis. 1990. An assessment of the Wateree River fish community in the vicinity of Union Camp, Eastover, South Carolina. SCWMRD Special Completion Rept. WC-4. SCWMRD. Columbia, SC. 49 pp.

Eversole, A. G. 2014. Identification and distribution of crayfishes in South Carolina: A South Carolina State Wildlife Grants Project Final Report. SCDNR. Columbia, SC. 69 pp. https://griffingroups.com/file/view/377780/identification-and-distribution-of-crayfish-in-south-carolina-eversole-2014. Last accessed March 31, 2016.

Michie, J. L. 1980. An archeological survey of Congaree Swamp: Cultural resources inventory and assessment of a bottomland environment in central South Carolina. University of South Carolina Scholar Commons *Research Manuscript Series.* Book 156. SC Institute of Archaeology and Anthropology. Columbia, SC. 157 pp. http://scholarcommons.sc.edu/cgi/viewcontent.cgi?article=1155&context=archanth_books. Last accessed Oct. 2016.

Rohde, F. C., R. G. Arndt, J. W. Foltz and J. M. Quattro. 2009. Freshwater fishes of South Carolina. University of South Carolina Press. Columbia, SC. 430 pp.

Rose, L. and J. Bulak. 2005. Species diversity and condition of the fish community during a drought in Congaree National Park. SCDNR Freshwater Fisheries Section. Columbia, SC. 39 pp. http://www.dnr.sc.gov/fish/fwfi/files/2003COSWFinalReportSubmitted10-28-2005.pdf. Last accessed March 31, 2016.

____ and ____. 2007. Flood mediated change of the fish community in Congaree National Park streams. SCDNR Freshwater Fisheries. Columbia, SC. 25 pp. http://www.dnr.sc.gov/fish/fwfi/files/2005CNPPostFloodReport.pdf. Last accessed March 31, 2016.

South Carolina Department of Health and Environmental Control. 2013. Watershed water quality assessment: Santee River Basin. Tech. Rept. No. 0620-13. SCDHEC Bureau of Water. Columbia, SC.

254 pp. http://www.scdhec.gov/HomeandEnvironment/docs/San_Whole.pdf. Last accessed March 31, 2016.

South Carolina Department of Natural Resources. 2013. An Overview of the eight major river basins of South Carolina. SCDNR. Columbia, SC. 30 pp. https://www.dnr.sc.gov/water/waterplan/pdf/Major_Basins_of_South_Carolina.pdf. Last accessed March 31, 2016

_____. 2015. South Carolina state wildlife action plan (SWAP). SCDNR. Columbia, SC. http://www.dnr.sc.gov/swap/index.html. Last accessed March 31, 2016.

Wachob, A., A. D. Park and R. Newcome, Jr. 2009. South Carolina state water assessment: Second Edition. SCDNR Land, Water and Conservation. Columbia, SC. http://www.dnr.sc.gov/water/hydro/HydroPubs/assessment/SC_Water_Assessment_2.pdf. Last accessed March 31, 2016.